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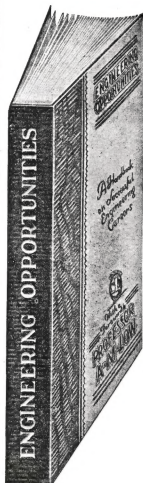
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Science Fiction



OFF THE BEAM
BY GEORGE O. SMITH

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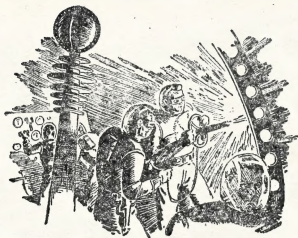
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All stories in this magazine are fiction. No actual persons are designated either by name or character. Any similarity is coincidental.



OFF THE BEAM

By **GEORGE O. SMITH**

Communication from ship to planet was a nice intellectual problem for Don Channing—till he was on the wrecked ship that had to call for help!

THIRTY hours out of Mars for Terra, the *Solar Queen* sped along her silent, invisible course. No longer was she completely severed from all connection with the planets of the inner system; the trick cams that controlled the beams at Venus Equilateral kept the ship centered by sheer mathematics. It was a poor communications system, however, since it was but a one-way job. Any message-answering would have to be done thirty hours later when the ship made planetfall, and the regular terminal office of Interplanetary Communications could be employed.

In spite of her thirty hours at 2-G, which brought her velocity to eleven hundred miles per second, the beam-director cams did their job well enough. It was only in extreme cases of course-changing to dodge meteors that the beams lost the ship; since the cams were not clairvoyant, there was no way to know when the autopilot juggled the controls to miss a bit of cosmic dust. The cams continued to spear the space through which the ship was supposed to pass according to the course constants.

What made this trip ironic was the fact that Don Channing was aboard. The beams had been bombarding the *Solar Queen* continually ever since she left Mars with messages for the Director of Communications. In one sense, it seemed funny that Channing was for once on the end of a communications line where people could talk to him but upon which he could not talk back. On the other hand it was a blessing in disguise, for the Director of Communications was beginning to paper-talk himself into some means of contacting the Relay Station from a spaceship.

A steward found Channing in the salon and handed him a 'gram. Channing smiled, and the steward returned the smile and added: "You'll fix these ships to talk back one day. Wait until you read that one—you'll burn from here to Terra!"

"Reading my mail?" asked Channing cheerfully. The average spacegram was about as secret as a postcard, so Channing didn't mind. He turned the page over and read:

HOPE YOU'RE WELL FILLED WITH GRAVANOL AND ADHESIVE TAPE FOR YOUR JUMP FROM TERRA TO STATION. SHALL TAKE GREAT DELIGHT IN RIPPING ADHESIVE TAPE OFF YOUR MEASLY BODY. LOVE.

ARDEN

"She will, too," grinned Don. "Well, I'd like to toss her one back, but she's got me there. I'll just fortify myself at the bar and think up a few choice ones for when we hit Mojave."

"Some day you'll be able to answer those," promised the steward. "Mind telling me why it's so tough?"

"Not at all," smiled Channing. "The problem is about the same as encountered by the old-time cowboy. It's a lot easier to hit a man on a moving horse from a nice, solid rock than it is to hit a man on a nice, solid rock from a moving horse. Venus Equilateral is quite solid as things go. But a spaceship's course is fierce. We're wobbling a few milliseconds here and a few there, and by the time you use that arc to swing a line of a hundred million miles, you're squirting quite a bit of sky. We're tinkering with it right now, but so far we have come up with nothing. Ah, well, since the human race got along without electric lights for a few million years, we can afford to tinker with an idea for a few months. Nobody is losing lives or sleep because we can't talk to the boys back home."

"We've been hopping from planet to planet for quite a number of years too," said the steward. "Quite a lot of them went by before it was even possible to contact a ship in space."

"And that was done because of an emergency. Probably this other thing will go on until we hit an emergency; then we shall prove that old statement about a loaf of bread being the maternal parent of a locomotive." Channing lit a cigarette, and puffed deeply. "Where do we stand?"

"Thirty hours out," answered the steward. "About ready for turnover. I imagine that the poor engineer's gang is changing cathodes about now."

"It's a long drag," said Channing. He addressed himself to his glass and began to think of a suitable answer for his wife's latest thrust.

ship. "Hadley to pilot room: Cathodes 1 and 3 ready."

"Pilot Greenland to Engineer Hadley: Power fade-over from even to odd now under way. Tubes 2 and 4 now dead: load on 1 and 3. You may enter 2 and 4."

"Check!"

Hadley cracked an air valve beside a circular air door. The hiss of entering air crescendoed and died, and then Hadley cracked the door that opened in upon the huge driver tube. With casual disregard for the annular electrodes that filled the tube and the sudden death that would come if the pilot sent the driving voltages surging into the electrodes, Hadley climbed to the top of the tube and used a spanner to remove four huge bolts. A handy differential pulley permitted him to lower the near-exhausted cathode from the girders to the air door where it was hauled to the deck. A fresh cathode was slung to the pulley and hoisted to place. Hadley bolted it tight and clambered back into the ship. He closed the air door and the valve, and then opened the valve that led from the tube to outer space. The tube evacuated and Hadley spoke once more to the pilot room.

"Hadley to Greenland: Tube 4 ready."

"Check."

The operation was repeated on Tube 2, and then Pilot Greenland said: "Fade-back beginning. Power diminishing on 1 and 3, increasing on 2 and 4. Power equalized, acceleration 2-G as before. Deviation from norm: two-tenths G."

Hadley grinned at the crew. "You'd think that Greenland did all that himself, the way he talks. If it weren't for autopilots, we'd have been all over the sky."

Tom Bennington laughed. He was an old-timer, and he said in a reminiscent tone: "I remember when we used to do that on manual. There were as many cases of *mal de void* during cathode change as during turnover. Autopilots are the nuts—look! We're about to swing right now, and I'll bet a fiver that the folks below won't know a thing about it."

A coincidence of mammoth proportions occurred at precisely that instant. It was a probability that made the chance of drawing a royal flush look like the chances of tomorrow coming on time. It was, in fact, one of those things that they said couldn't possibly happen, which went to prove only how wrong they were. It hadn't happened yet and probably wouldn't happen again

Bill Hadley, of the power engineer's gang, spoke to the pilot's greenhouse below the

for a million million years, but it did happen once.

Turnover was about to start. A relay circuit that coupled the meteor-spotter to the autopilot froze for a bare instant, and the coincidence happened between the freezing of the relay contacts and the closing of another relay whose purpose it was to shut the coupler circuits through another line in case of relay failure. In the inconceivable short time between the failure and the device that corrected failure, the *Solar Queen* hit a meteor head on.

It is of such coincidences that great tragedies and great victories are born.

The meteor, a small one as cosmic objects go, passed in through the broad observation dome at the top of the ship. Unhampered, it zipped through the central well of the *Solar Queen* and passed out through the pilot's greenhouse at the bottom of the ship. Its speed was nothing worth noting; a scant twenty miles per second almost sunward. But the eleven hundred miles per second of the *Solar Queen* made the passage of the meteor through the six hundred feet of the ship's length of less duration than the fastest camera shutter.

In those microseconds, the meteor did much damage.

It passed through the main pilot-room cable and scrambled those circuits which it did not break entirely. It tore the elevator system from its moorings. It entered as a small hole in the observation dome and left taking the entire pilot's greenhouse and all of the complex paraphernalia with it.

The lines to the driver tubes were scrambled, and the ship shuddered and drove forward at 10-G. An inertia switch tried to function, but the resetting solenoid had become shorted across the main battery and the weight could not drop.

Air doors clanged shut, closing the central well from the rest of the ship and effectively sealing the well from the crew.

The lights in the ship flickered and died. The cable's shorted lines grew hot and fire crept along its length and threatened the continuity. The heat opened fire-quenching vents and a cloud of CO₂ emerged together with some of the liquid gas itself. The gas quenched the fire and the cold liquid cooled the cable. Fuses blew in the shorted circuits—

And the *Solar Queen* continued to plunge on and on at 10-G; the maximum possible out of her driving system.

The only man who remained aware of himself aboard the *Solgr Queen* was the man who was filled with gravanol and adhesive tape. No other person expected to be hammered down by high acceleration. Only Channing, who was planning to leave Terra in his own little scooter, was prepared to withstand high G. He, with his characteristic hate of doing anything slowly, was ready to make the Terra to Venus Equilateral passage at 5- or 6-G.

It might as well have caught him, too. With all of the rest unconscious, hurt, or dead, he was alone and firmly fastened to the floor of the salon under eighteen hundred pounds of his own, helpless weight.

And as the hours passed, the *Solar Queen* was driving farther and farther from the imaginary spot that was the focus of the communicator beams from Venus Equilateral.

The newly-replaced cathodes in the driving tubes were capable of driving the ship for about two hundred G-hours at 1-G, before exhaustion to the point of necessary replacement for safety purposes. The proportion is not linear, nor is it a square-law, but roughly it lies in the region just above linear, so that the *Solar Queen* drove on and on through space for ten hours at 10-G before the cathodes died for want of emitting surface. They died, not at once, but in irregular succession so that when the last erg of power was gone from the ship it was zooming on a straight line tangent from its point of collision but rolling in a wild gyration through the void.

And twenty-five hundred miles per second added to her initial velocity of eleven hundred miles per second added up to thirty-six hundred miles per second. She should have had about seventy-five million miles to go at 2-G, to reach Terra in thirty hours from the halfway point where she turned ends to go into deceleration. Instead, the *Solar Queen* after ten hours of misdirected 10-G acceleration was thirty million miles on her way, or about halfway to Terra. Three hours later, driving free, the *Solar Queen* was passing Terra, having missed the planet by a few million miles.

Back in space, at an imaginary junction between the beams from Venus Equilateral and the course registered for the *Solar Queen*, Arden Channing's latest message was indicating all sorts of mild punishment for her husband when she got him home.

By the time that the *Solar Queen* should have been dropping out of the sky at

Mojave Spaceport, the ship would be one hundred and ninety million miles beyond Terra and flirting with the imaginary line that marked the orbit of Mars.

That would be in seventeen hours.

Weightless, Channing pursued a crazy course in the salon of the spinning ship. He ached all over from the pressure, but the gravalol had kept his head clear and the adhesive tape had kept his body intact. He squirmed around in the dimness and could see the inert figures of the rest of the people who had occupied the salon at the time of the mishap. He became sick. Violence was not a part of Channing's nature—at least he confined his violence to those against whom he required defense. But he knew that many of those people who pursued aimless orbits in the midair of the salon with him would never set foot on solidness again.

He wondered how many broken bones there were among those who had lived through the ordeal. He wondered if the medical staff of one doctor and two nurses could cope with it.

Then he wondered what difference it made if they were to go on and on, and from that thought came the one he should have thought of first: How were they to stop going on and on? Channing had a rough idea of what had happened. He knew something about the conditions under which they had been traveling, how long, and in which direction. It staggered him, the figures he calculated in his mind. It behoved him to do something.

He bumped an inert figure, and grabbed. One hand took the back of the head and came away wet and sticky. Channing retched, and then threw the inert man from him. He coasted back against a wall, and caught a handrail. Hand-over-hand he went to the door and into the hall. Down the hall he went to the passengers' elevator shaft and with no thought of what his action would have been on any planet, Channing opened the door and drove down the shaft for several decks. He emerged and headed for the sick ward.

He found the doctor clinging to his operating table with his knees and applying a bandage to one of his nurses' heads.

"Hello, Doc," said Channing. "Help?"

"Grab Jen's feet and hold her down," snapped the doctor.

"Bad?" asked Don as he caught the flailing feet.

"Seven stitches, no fracture," said the doctor.

"How's the other one?"

"Unconscious, but unharmed. Both asleep in bed, thank God. So was I. Where were—? You're Channing and were all doped up with gravalol and adhesive. Thank yourself a god for that, too. I'm going to need both of my nurses and we'll all need you."

"Hope I can do some good," said Don.

"You'd better. Or any good I can do will be wasted. Better start right now. Here," the doctor produced a set of keys, "these will unlock anything in the ship but the purser's safe. You'll need 'em. Now get along and do something and leave the body-mending to me. Scram!"

"Can you make out all right?"

"As best I can. But you're needed to get us help. If you can't, no man in the Solar System can. You're in the position of a man who can not afford to help in succoring the wounded and dying. It'll be tough, but there it is. Get cutting. And for Heaven's sake, get us two things: Light and a floor. I couldn't do more than slap on tape whilst floating in air. See you later, Channing, and good luck."

The nurse squirmed, groaned, and opened her eyes. "What happened?" she asked, blinking into the doctor's flashlight.

"Tell you later, Jen. Get Fern out of her coma in the ward and then we'll map out a plan. Channing, get out of here!"

Channing got after borrowing a spare flashlight from the doctor.

He found Hadley up in the instrument room with a half dozen of his men. They were a mass of minor and major cuts and injuries, and were working under a single incandescent lamp that had been wired to the battery direct by means of spare cable. The wire went snaking through the air in a foolish, crooked line, suspended on nothing. Hadley's gang were applying first aid to one another and cursing the lack of gravity.

"Help?" said Channing

"Need it or offer it?" asked Hadley with a smile.

"Offer it. You'll need it."

"You can say that again—and then pitch in. You're Channing, of Communications, aren't you? We're going to have a mad scramble on the main circuits of this tub before we can unwind it. I don't think there's an instrument working in the whole ship."

"You can't unravel the whole works, can you?"

"Won't try. About all we can do is replace the lighting system and hang the dead cathodes in again. They'll be all right to take us out of this cockeyed skew-curve and probably will last long enough to keep a half-G floor under us for tinkering, for maybe forty or fifty hours. Assistant Pilot Darlange will have to learn how to run a ship by the seat of his pants—as far as I can guess there isn't even a splinter of glass left in the pilot room—so he'll have to correct this flight by feel and by using a haywire panel."

"Darlange is a school-pilot," grinned one of Hadley's men.

"I know, Jimmy, but I've seen him work on a bum autopilot, and he can handle haywire all right. It'll be tough without Greenland, but Greenland—" Hadley let the sentence fall; there was no need to mention the fact that Greenland was probably back there with the rest of the wreckage torn from the *Solar Queen*.

Jimmy nodded, and the action shook him from his position. He grabbed at a roll of tape that was floating near him and let it go with a laugh as he realized it was too light to do him any good.

"Too bad that this gyration is not enough to make a decent gravity at the ends, at least," snorted Hadley. He hooked Jimmy by an arm and hauled the man back to a place beside him. "Now look," he said, "I can't possibly guess how many people are still in working condition after this. Aside from our taped and doped friend here, the only ones I have are we who were snoozing in our beds when the crush came. I'll bet a cooky that the rest of the crowd are all nursing busted ribs, and worse. Lucky that full G died slowly as the cathodes went out; otherwise we'd all have been tossed against the ceilings with bad effects."

"Jimmy, you're a committee of one to roam the crate and make a list of everyone who is still in the running and those who can be given minor repairs to make them fit for limited work. Doc has a pretty good supply of Stader splints; inform him that these are only to be used on men who can be useful with them. The rest will have to take to plaster casts and the old-fashioned kind of fracture-support."

"Pete, you get to the executive deck and tell Captain Johansson that we're on the job and about to make with repairs. As power engineer, I've control of the maintenance

gang too, and we'll collect the whole, hale, and hearty of Michaels' crew on our merry way."

"Tom, take three of your men and begin to unravel the mess with an eye toward getting us lights."

"Tony, you can do this alone since we have no weight. You get the stale cathodes from the supply hold and hang 'em back in the tubes."

"Channing, until we get a stable place, you couldn't do a thing about trying to get help, so I suggest that you pitch in with Bennington, there, and help unscramble the wiring. You're a circuit man, and though power-line stuff is not your forte, you'll find that running a lighting circuit is a lot easier than neutralizing a microwave transmitter. Once we get light, you can help us haywire a control panel. Right?"

"Right. And as far as contacting the folks back home goes, we couldn't do a darned thing until the times comes when we should be dropping in on Mojave. They won't be looking for anything from us until we're reported missing; then I imagine that Walt Franks will have everything from a spintharoscope to a gold-foil electroscope set up. Right now I'm stumped, but we have seventeen hours before we can start hoping to be detected. Tom, where do we begin?"

Bennington smiled inwardly. To have Don Channing asking him for orders was like having Captain Johansson request the batteryman's permission to change course. "If you can find and remove the place where the shorted line is, and then splice the lighting circuits again, we'll have a big hunk of our work done. The rest of us will begin to take lines off of the pilot's circuits right here in the instrument room so that our jury-controls can be hooked in. You'll need a suit, I think, because I'll bet a hat that the shorted line is in the well."

For the next five hours, the instrument room became a beehive of activity. Men began coming in driblets, and were put to work as they came. The weightlessness gave quite a bit of trouble; had the instrument panels been electrically hot, it would have been downright dangerous since it was impossible to do any kind of work without periodically coming against bare connections. Tools floated around the room in profusion, and finally Hadley appointed one man to do nothing but roam the place to retrieve "dropped" tools. The soldering operations were particularly vicious, since

the instinctive act of flinging excess solder from the tip of an iron made droplets of hot solder go zipping around the room to splash against something, after which the splashes would continue to float.

Men who came in seeking to give aid were handed tools and told to do this or that, and the problem of explaining how to free a frozen relay to unskilled help was terrific.

Then at the end of five hours, Channing came floating in to the instrument room. He flipped off the helmet and said to Hadley: "Make with the main switch. I think I've got it."

Throughout the ship the lights blinked on. With the coming of light, there came hope also. Men took a figurative hitch in their belts and went to work with renewed vigor. It seemed as though everything came to a head at about this time, too. Hadley informed Darlange that his jury-control was rigged and ready for action, and about the same time, the galley crew came in with slender-necked bottles of coffee and rolls.

"It was a job, making coffee," grinned the steward. "The darned stuff wanted to get out of the can and go roaming all over the place. There isn't a one of us that hasn't got a hot coffee scar on us somewhere. Now if he"—nodding at Darlange—"can get this thing straightened out, we'll have a real dinner."

"Hear that, Al? All that stands between us and dinner is you. Make with the ship-straightening. Then we'll all sit around and wait for Channing to think."

"Is the ship's communicator in working order?" asked Darlange.

"Sure. That went on with the lights."

Darlange called for everyone in the ship to hold himself down, and then he tied his belt to the frame in front of the haywired panel. He opened the power on drivers 1 and 2, and the ship's floor surged ever so little.

"How're you going to know?" asked Hadley.

"I've got one eye on the gyro-compass," said Darlange. "When it stops turning, we're going straight. Then all we have to do is to set our bottom end along the line of flight and pack on the decel. Might as well do it that way since every MPS we can lose is to our advantage."

He snapped switches that added power to Driver 3. Gradually the gyro-compass changed from a complex rotation-progression to a simpler pattern, and eventually the

simple pattern died, leaving but one freedom of rotation. "I'm sort of stumped," grinned Darlange. "We're now hopping along, but rotating on our long axis. How we stop axial rotation with drivers set parallel to that axis I'll never guess."

"Is there a lifeship in working order?" asked Hadley.

"Sure."

"Tom, turn it against the rotation and apply the drivers on that until we tell you to stop."

An hour later the ship had ceased to turn. Then Darlange jockeyed the big ship around so that the bottom was along the line of flight. Then he set the power for a half-G, and everyone relaxed.

Ten minutes later Captain Johansson came in.

"You've done a fine job," he told Hadley. "And now I declare an hour off for dinner. Dr. MacLain has got a working medical center with the aid of a few people who understand how such things work, and the percentage of broken bones, though terrific in number, is being taken care of. The passengers were pretty restive at first, but the coming of light seemed to work wonders. This first glimmer of power is another. About nine or ten who were able to do so were having severe cases of skysickness." He smiled ruefully. "I'm not too sure that I like no-weight myself."

"Have you been in the observation dome?" asked Don.

"Yes. It's pierced, you know."

"Did the meteor hit the telescope?"

"No, why?"

"Because I'm going to have to get a sight on Venus Equilateral before we can do anything. We'll have to beam them something, but I don't know what right now."

"Can we discuss that over a dinner?" asked the captain. "I'm starved, and I think that the rest of this gang is also."

"You're a man after my own heart," laughed Channing. "The bunch out at the Station wouldn't believe me if I claimed to have done anything without drawing it up on a tablecloth."

"Now," said Channing over his coffee. "What have we in the way of electronic equipment?"

"One X-ray machine, a standard set of communicating equipment, one beam receiver with type machine for collecting stuff from your Station, and so on."

"You wouldn't have a betatron in the place somewhere?" asked Don hopefully.

"Nope. Could we make one?"

"Sure. Have you got about ten pounds of No. 18 wire?"

"No."

"Then we can't."

"Couldn't we use a driver? Isn't that some kind of beam?"

"Some kind," admitted Channing. "But it emits something that we've never been able to detect except in an atmosphere where it ionizes the air into a dull red glow."

"You should have been wrecked on the *Sorcerer's Apprentice*," laughed Hadley. "They're the guys who have all that kind of stuff."

"Have they?" asked Johansson.

"The last time I heard, they were using a large hunk of their upper hull for a VanDerGraf generator."

"That would do it," said Channing thoughtfully. "But I don't think I'd know how to modulate a VanDerGraf. A betatron would be the thing. You can modulate that, sort of, by keying the input. She'd give out with hundred-and-fifty-cycle stuff, but so what? We made the *Empress of Kolain* sit up and say uncle on hundred-cycle stuff. How much of a trick is it to clear the observation dome from the top?"

"What do you intend to do?"

"Well, we've got a long, hollow tube in this ship. Knock out the faceted dome above, and we can rig us up a huge electron gun. We'll turn the ship to point at the Station and beam 'em a bouquet of electrons."

"How're you going to do that?"

"Not too tough, I don't think. Down here," and Channing began to trace on the tablecloth, "we'll put us a hot cathode. About this level we'll hang the first anode, and at this level we'll put the second anode. Here'll be an acceleration electrode, and up near the top we'll put a series of focusing anodes. We'll tap in to the driver-tube supply and take off voltages to suit us. Might use a tube at that, but the conversion to make an honest electron gun out of it would disrupt our power, and then it would be impossible to make a driver out of it again without recourse to a machine shop."

"How are you going to make electrodes?"

"We'll use the annular gratings that run around the central well at each level," said Channing. "We'll have a crew of men cut

'em free and insulate the resulting rings with something. Got anything?"

"There is a shipment of methylmethacrylate rods for the Venus Power Co. in Hold 17," said the cargo master.

"Fine," said Channing. "What size?"

"Three inches by six feet."

"It'll be tricky work, and you'll have to wait until your cut edge has cooled before you hook on the rods," mused Don. "But that's the ticket."

"Which floors do you want?"

"Have you got a scale drawing of the *Solar Queen*?"

"Sure."

"Then this is where my tablecloth artistry falls flat. The focusing of an electron beam depends upon the electrode spacing and the voltage. Since our voltage is fixed if we take it from the driver electrodes, we'll have to do some mighty fine figuring. I'll need that scale drawing."

Channing's tablecloth engineering was not completely wasted. By the time the scale drawing was placed before him, Channing had half of the table filled with equations. He studied the drawing, and selected the levels which were to serve as electrodes. He handed the drawing to Hadley, and the power engineer began to issue instructions to his gang.

Then the central well began to swarm with spacesuited men who bore cutting torches. Hot sparks danced from the cut girders that held the floorings, and at the same time, a crew of men were running cables from the various levels to the instrument room. More hours passed while the circular sections were insulated with the plastic rods.

The big dome above was cut in sections and removed, and then the sky could be seen all the way from the bottom of the ship where the pilot's greenhouse should have been.

Channing looked it over and then remarked: "All we need now is an electron collector."

"I thought you wanted to shoot 'em off," objected Hadley.

"I do. But we've got to have a source of supply. You can't toss baseballs off of the Transplanet Building in Northern Landing all afternoon, you know, without having a few brought to you now and then. Where do you think they come from?"

"Hadden't thought of it in that way. What'd happen?"

"We'd get along for the first umpty-gillion electrons, and then all the soup we could pack on would be equalized by the positive charge on the ship and we couldn't shoot out any more until we got bombarded by the sun—and that bombardment is nothing to write home about as goes quantity. What we need is a selective solar intake plate of goodly proportions."

"We could use a mental telepathy expert, too. Or one of those new beams that Baler and Carroll dug up out of the Martian desert. I've heard that those things will actually suck power out of any source, and bend beams so as to enter the intake vent, or end."

"We haven't one of those, either. Fact of the matter is," grinned Channing ruefully, "we haven't much of anything but our wits."

"Unarmed, practically," laughed Hadley.

"Half armed, at least. Ah, for something to soak up electrons. I'm now wondering if this electron gun is such a good idea."

"Might squirt some protons out the other direction," offered Hadley.

"That would leave us without either," said Don. "We'd be like the man who tossed baseballs off of one side and himself off the other— Hey! Of course we have some to spare. We can cram electrons out of the business end, thus stripping the planetary rings from the atoms in our cathode. From the far side we'll shoot the canal rays, which in effect will be squirting protons, or the nuclei. Since the planetaries have left for the front, it shouldn't be hard to take the protons away, leaving nothing. At our present voltages, we might be able to do it." Channing began to figure again, and he came up with another set of anodes to be placed beyond the cathode. "We'll ventilate the cathode and hang these negative electrodes on the far side. They will attract the protons, impelled also by the positive charge on the front end. We'll maintain a balance that way, effectively throwing away the whole atomic structure of the cathode. The latter will fade, just as the cathodes do in the driving tubes, only we'll be using electronic power instead of sub-electronic. Y'know, Hadley, some day someone is going to find a way to detect the—we'll call it radiation for want of anything better—of the driver. And then there will open an entirely new field of energy. I don't think that anybody has done more about the so-called sub-electronic field than to make a nice, efficient driving device out of it."

"Well, let's get our canal-ray electrodes

in place. We've got about two hours before they realize that we aren't going to come in at Mojave. Then another two hours worth of wild messages between the Relay Station and Mojave. Then we can expect someone to be on the lookout. I hope to be there when they begin to look for us. At our present velocity, we'll be flirting with the Asteroid Belt in less than nothing flat. That isn't too bad—normally—but we're running without any meteor detector and autopilot coupler. We couldn't duck anything from a robin's egg on up."

"We'll get your anodes set," said Hadley.

Walt Franks grinned at Arden Channing. "That'll burn him," he assured her.

"It's been on the way for about twenty minutes," laughed Arden. "I timed it to arrive at Terra at the same time the *Solar Queen* does. They'll send out a special messenger with it, just as Don is getting aboard his little scooter. It'll be the last word, for we're not following him from Terra to here."

"You know what you've started?" asked Franks.

"Nothing more than a little feud between husband and self."

"That's just the start. Before he gets done, Don will have every ship capable of answering back. I've found that you can catch him off base just once. He's a genius—one of those men who never make the same mistake twice. He'll never again be in a position to be on the listening end only."

"Don's answer should be on the way back by now," said Arden. "Could be you're right. Something should be done."

"Sure I'm right. Look at all the time that's wasted in waiting for a landing to answer grams. In this day and age, time is money, squared. The latter is to differentiate between this time and the first glimmering of speedy living."

"Was there a first glimmering?" asked Arden sagely. "I've often thought that the speed-up was a stable acceleration from the dawn of time to the present."

"All right, go technical on me," laughed Walt. "Things do move. That is, all except that message from your loving husband."

"You don't suppose he's squelched?"

"I doubt it. Squelching Donald Channing is a job for a superbeing. And I'm not too sure that a superbeing could squelch Don and make him stay squelched. Better check on Mojave."

"Gosh, if Don missed the *Solar Queen*

and I've been shooting him all kinds of screwy types, every hour on the hour; Walt, that'll keep him quiet for a long, long time."

"He'd have let you know."

"That wouldn't have been so bad. But if the big bum missed and was ashamed of it—that'll be the payoff. Woah, there goes the type!"

Arden drew the tape from the machine:

MESSAGE BEING HELD FOR ARRIVAL OF SOLAR QUEEN.

Walt looked at his watch and checked the course constants of the *Solar Queen*. He called the beam-control dome and asked for the man on the *Solar Queen* beam.

"Benny," he said, "has the *Solar Queen* arrived yet?"

"Sure," answered Benny. "According to the mechanical mind here, they've been on Mojave for twenty minutes."

"Thanks." To Arden he said: "Something's strictly fishy."

Arden sat at the machine and pounded the keys:

SOLAR QUEEN DUE TO ARRIVE AT 19:06:41. IT IS NOW 19:27:00. BEAM CONTROL SAYS TRANSMISSIONS ENDED BECAUSE OF COINCIDENCE BETWEEN TERRA BEAM AND STATION-TO-SHIP BEAM. PLEASE CHECK.

Arden fretted and Walt stamped up and down the room during the long minutes necessary for the message to reach Terra and the answer to return. It came right on the tick of the clock:

HAVE CHECKED COURSE CONSTANTS. SOLAR QUEEN OVERDUE NOW FIFTY MINUTES. OBVIOUSLY SOMETHING WRONG. CAN YOU HELP?

Walt smiled in a grim fashion. "Help!" he said. "We go on and on for years and years with no trouble—and now we've lost the third ship in a row."

"They claim that those things always run in threes," said Arden. "What are we going to do?"

"I don't know. We'll have to do something. Funny, but the one reason we must do something is the same reason why something can be done."

"I don't get that."

"With Channing on the *Solar Queen*, something can be done. I don't know what, but I'll bet you a new hat that Don will make it possible for us to detect the ship. There is not a doubt in my mind that if the ship is still spaceworthy, we can narrow the possibilities down to a thin cone of space."

"How?"

"Well," said Franks, taking the fountain pen out of the holder on the desk and beginning to sketch on the blotter, "the course of the *Solar Queen* is not a very crooked one, as courses go. It's a very shallow skew curve. Admitting the worst, collision, we can assume only one thing. If the meteor were small enough to leave the ship in a floating but undirigible condition, it would also be small enough to do nothing to the general direction of the ship. Anything else would make it useless to hunt, follow?"

"Yes, go on."

"Therefore we may assume that the present position of the *Solar Queen* is within the volume of a cone made by the tangents of the outermost elements of the space curve that is the *Solar Queen's* course. We can take an eight-thousand-mile cylinder out of one place—for the origin of their trouble is between Mars and Terra and the 'shadow' of Terra in the cone will not contain the *Solar Queen*."

"Might have passed close enough to Terra to throw her right into the 'shadow' of Terra by attraction," objected Arden.

"Yeah, you're right. O.K., so we can't take out that cylinder of space. And we add a sort of sidewise cone on to our original cone, a volume through which the *Queen* might have flown after passing close enough to Terra to be deflected. I'll have the slip-stick experts give a guess as to the probability of the *Queen's* course, and at the same time we'll suspend all incoming operations. I'm going to set up every kind of detector I can think of, and I don't want anything upsetting them."

"What kind of stuff do you expect?" asked Arden.

"I dunno. They might have a betatron aboard. In that case we'll eventually get a blast of electrons that'll knock our front teeth out. Don may succeed in tinkering up some sort of electrostatic field. We can check the solar electrostatic field to about seven decimal places right here, and any deviation in the field to the tune of a couple of million electron volts at a distance of a hundred

million miles will cause a distortion in the field that we can measure. We'll ply oscillating beams through the area of expectation and hope for an answering reflection, though I do not hope for that. We'll have men on the lookout for everything from smoke signals to helio. Don't worry too much, Arden, your husband is capable of doing something big enough to be heard. He's just the guy to do it."

"I know," said Arden soberly. "But I can't help worrying."

"Me, too. Well, I'm off to set up detectors. We'll collect something."

"Have we got anything like a piece of gold leaf?" asked Channing.

"I think so, why?"

"I want to make an electroscope. That's about the only way I'll know whether we are getting out with this cockeyed electron gun."

"How so?" asked Hadley.

"We can tell from the meter that reads the beam current whether anything is going up the pipe," explained Channing. "But if we just build us up a nice heavy duty charge—as shown by the electroscope—we'll be sure that the electrons are not going far. This is one case where no sign is good news."

"I'll have one of the boys set up an electroscope in the instrument room."

"Good. And now have the bird on the telescope forget trying to find Venus Equilateral by dead reckoning and sight. Have him set the scope angles to the figures here, and then have him contact Darlange and have the ship slued around so that Venus is on the cross hairs. That'll put us on a line for the Station by a few thousand miles. We can afford to miss. A bundle of electrons of our magnitude zipping past the detectors that Walt can set up will make a reading."

Hadley called the observation dome. "Tim," he said, giving a string of figures, "set your 'scope for these and then get Darlange to slue the crate around so that your cross hairs are on Venus."

"O.K.," answered Tim. "That's going to be a job. This business of looking through a 'scope while dressed in a spacesuit is no fun. Here goes."

He called Darlange, and the communicator system permitted the men in the instrument room to hear his voice. "Dar," he said, "loop us around about forty-one degrees from Driver 3."

Darlange said: "Right!" and busied himself at his buttons.

"Three degrees on Driver 4."

"Right."

"Too far, back her up a degree on 4."

Darlange laughed. "What do you think these things are, blocks and tackles? You mean: 'Compensate a degree on 2.'"

"You're the pilot. That's the ticket—and I don't care if you lift it on one hand. Can you nudge her just a red hair on 3?"

"Best I can do is a hair and a half," said Darlange. He gave Driver 3 just a tiny, instantaneous surge.

"Then take it up two and back one and a half," laughed Tim. "Woah, Nellie, you're on the beam."

"Fine."

"O.K., Dar, but you'll have to play monkey on a stick. I'll prime you for any moving so that you can correct immediately."

"Right. Don, we're on the constants you gave us. What now?"

"At this point I think a short prayer would be of assistance," said Channing soberly. "We're shooting our whole wad right now."

"I hope we make our point."

"Well, it's all or nothing," agreed Don as he grasped the switch.

He closed the switch, and the power demand meters jumped up across their scales. The gold-leaf electroscope jumped once; the ultra-thin leaves jerked apart by an inch, and then oscillated stiffly until they came to a balance. Channing, who had been looking at them, breathed deeply and smiled.

"We're getting out," he said.

"Can you key this?" asked Hadley.

"No need," said Channing. "They know we're in the grease. We know that if they can collect us, they'll be on their way. I'm going to send out for a half-hour, and then resort to a five-minute transmission every fifteen minutes. They'll get a ship after us with just about everything we're likely to need, and they can use the five-minute transmissions for direction finding. The initial shot will serve to give them an idea as to our direction. All we can do now is to wait."

"And hope," added Captain Johansson.

Electrically, Venus Equilateral was more silent than it had ever been. Not an electrical appliance was running on the whole station. People were cautioned about walking on deep-pile rugs, or combing their hair

with plastic combs, or doing anything that would set up any kind of electronic charge. Only the highly filtered generators in the power rooms were running and these had been shielded and filtered long years ago; nothing would emerge from them to interrupt the ether. All incoming signals were stopped.

And the men who listened with straining ears claimed that the sky was absolutely clear save for a faint crackle of cosmic static which they knew came from the corona of the sun.

One group of men sat about a static-field indicator and cursed the minute wiggling of the meter, caused by the ever-moving celestial bodies and their electronic charges. A sunspot emission passed through the Station once, and though it was but a brief passage, it sent the electrostatic field crazy and made the men jump.

The men who were straining their ears to hear became nervous, and were jumping at every loud crackle.

And though the man at the telescope knew that his probability of picking up a sight of the *Solar Queen* was as slender as a spider's web, he continued to search the starry heavens. He swept the narrow cone of the heavens wherein the *Solar Queen* was lost according to the mathematical experts, and he looked at every bit of brightness in the field of his telescope as though it might be the missing ship.

The beam-scanners watched their return-plates closely. It was difficult because the receiver gains were set to maximum, and every tick of static caused brief flashes of light upon their plates. They would jump at such a flash and watch for it to reappear on the next wipe, for a continuous spot of light indicated the ship they sought. Then, as the spot did not reappear, they would go on with their beams to cover another infinitesimal portion of the sky. Moving forward across the cone of expectancy bit by bit, they crossed and recrossed until they were growing restive.

Surely the ship must be there!

At the South End landing stage, a group of men were busy stocking a ship. Supplies and necessities were carried aboard, while another group of men tinkered with the electrical equipment. They cleared a big space in the observation dome, and began to install a replica of the equipment used on the Station for detection. No matter what kind of output Channing sent back,

they would be able to follow it to the bitter end.

They made their installations in duplicate, with one piece of each equipment on opposite sides of the blunt dome. Balancing the inputs of each kind by turning the entire ship would give them a good indication of direction.

Franks did not hope that the entire installation could be completed before the signal came, but he was trying to outguess himself by putting some of everything aboard. When and if it came, he would be either completely ready with everything or he at least would have a good start on any one of the number of detectors. If need be, the equipment from the Station itself could be removed and used to complete the mobile installation.

Everything was in a complete state of nervous expectancy. Watchers watched, meter readers squinted for the barest wiggle, audio observers listened, trying to filter any kind of man-made note out of the irregular crackle that came in.

And the Station announcing equipment was dead quiet, to be used only in case of emergency or to announce the first glimmer of radiation, whether it be material, electrical, kinetic, potential, or wave front.

Long they listened—and then it came.

The Station announcing equipment broke forth in a multitude of voices.

"Sound input on radio."

"Visual indication on scanner plates!"

"Distortion on electrostatic field indicator."

"Super-electroscopes indicate negative charge!"

"Nothing on the telescope!"

There were mingled cheers and laughter as the speaker system broke away from the babel, and each group spoke its piece with no interference. Walt Franks left the ship at the South End and raced to the Beam Control dome, just as fast as the runway car would take him. He ran into the dome in spacesuit and flipped the helmet back over his shoulders. "What kind of indication?" he yelled.

Men crowded around him, offering him papers and shouting figures.

"Gosh," he said. "Don can't have everything going up there."

"He's hit just about everything but the guy squinting through the 'scope."

"What's he doing?" asked Franks of no one in particular.

One of the radiation engineers who had been busy with the electrostatic field indicator said: "I think maybe he's using some sort of electron gun—like the one you tried first off on the meteor-destroyer-job, remember?"

"Yeah, but that one wouldn't work—unless Don's succeeded in doing something that we couldn't do. Look, Charley, we haven't had time to set up a complete field indicator on the ship. Grab yours and give the boys a lift installing it, hey?"

"Sure thing."

"And look, fellows, any indication of direction, velocity, or distance?"

"Look for yourself," said the man on the beam scanner. "The whole plate is shining. We can't get a fix on them this way—they're radiating themselves and that means that our scanner-system finder is worthless."

"We can, but it's rough," offered one of the radio men. "It came from an area out beyond Terra—and as for our readings it might have covered a quarter of the sky."

"The field indicator is a short-base finder," explained Charley. "And no less rough than the radio boys. I'd say it was out beyond Terra by fifty million miles at least."

"Close enough. We'll have to track 'em down like a radio-equipped bloodhound. Charley, come along and run that mechanico-electro-monstrosity of yours. Gene, you can come along and run the radio finder. Oh yes, you, Jimmy, may continue to squint through that eyepiece of yours—but on the *Relay Girl*. We need a good, first-class squinter, and you should have an opportunity to help."

Jimmy laughed shortly. "The only guy on the Station that didn't get an indication was me. Not even a glimmer."

"Channing didn't know we'd be looking for him, or he'd probably light a flare, too. Cheer up, Jimmy, after all this crude, electrical rigmarole is finished, and we gotta get right down to the last millimeter, it's the guy with the eye that polishes up the job. You'll have your turn."

Twenty minutes after the first glimmer of intelligent signal, the *Relay Girl* lifted from the South End and darted off at an angle, setting her nose roughly in the direction of the signal.

Her holds were filled with spare batteries and a whole dozen replacement cathodes as well as her own replacements. Her crew was filled to the eyebrows with gravanol,

and there must have been a mile of adhesive tape and cotton on their abdomens. At 6-G she left, and at 6-G she ran, her crew immobilized but awake because of the gravanol. And though the acceleration was terrific, the tape kept the body from folding of its own weight. When they returned, they would all be in the hospital for a week, but their friends would be with them.

Ten minutes after take-off, the signals ceased.

Walt said: "Keep her running. Don's saving electricity. Tell me when we pick him up again."

Franklin, the pilot, nodded. "We haven't got a good start yet. It'll be touch and go. According to the slipstick boys, they must be clapping it up at between twenty-five hundred and five thousand miles per second to get that far—and coasting free or nearly so. Otherwise they'd have come in. Any suggestions as to course?"

"Sure. Whoop it up at six until we hit about six thousand. Then decelerate to four thousand by using 1-G. We'll vacillate in velocity between four and five until we get close."

Forty-one hours later, the *Relay Queen* made turnover and began to decelerate.

Channing said to Captain Johannson: "Better cut the decel to about a quarter-G. That'll be enough to keep us from bumping our heads on the ceiling and it will last longer. This is going to be a long chase, and cutting down a few MPS at a half-G isn't going to make much never-mind. I'll hazard a guess that the boys are on their way right now."

"If you, say so," said Johannson. "You're the boss from now on. You know that wild bunch on the Station better than I do. For myself, I've always felt that an answer was desirable before we do anything."

"I know Franks and my wife pretty well—about as well as they know me. I've put myself in Walt's place—and I know that Walt would do. So—if Walt didn't think of it, Arden would—I can assume that they are aware of us, have received our signals, and are, therefore, coming along as fast as they can. They'll come zipping out here at from five to seven-G to what they think is halfway and then decelerate again to a sane velocity. We won't catch sight of them for sixty or seventy hours, and when we do, they'll be going so fast that it will take another twenty hours worth of manipulation to match their speed with ours. Mean-

while, I've got the gun timed to shoot our signal. When the going gets critical, I'll cut the power and make it continuous."

"You're pretty sure of your timing?"

"Well, the best they can do as for direction and velocity and distance is a crude guess. They'll place us out here beyond Terra somewhere. They'll calculate the course requirements to get us this far in the time allotted, and come to a crude figure. I'd like to try keying this thing, but I know that keying it won't work worth a hoot at this distance. Each bundle of keyed electrons would act as a separate negative charge that would spread out and close up at this distance. It's tough enough to hope that the electron beam will hold together that far, let alone trying to key intelligence with it. We'll leave well enough alone—and especially if they're trying to get a fix on us; there's nothing worse than trying to fix an intermittent station. Where are we now?"

"We're on the inner fringe of the Asteroid Belt, about thirty million miles North, and heading on a secant course at thirty-four hundred MPS."

"Too bad Jupiter isn't in the neighborhood," said Channing. "We'll be flirting with his orbit by the time they catch us."

"Easily," said Johannson. "In sixty hours, we'll have covered about six hundred and fifty million miles. We'll be nearer the orbit of Saturn, in spite of the secant course."

"Your secant approaches a radius as you get farther out," said Don, absently. "As far as distances go. Ah, well, Titan, here we come!"

Johannson spoke to the doctor. "How're we doing?"

"Pretty well," said Doc. "There's as pretty an assortment of fractured ribs, broken limbs, cracked clavicles, and scars, mars, and abrasions as you ever saw. There are a number dead, worse luck, but we can't do a thing about them. We can hold on for a week as far as food and water goes. Everyone is now interested in the manner of our rescue rather than worrying about it." He turned to Channing. "The words Channing and Venus Equilateral have wonderful healing powers," he said. "They all think your gang are part magician and part sorcerer."

"Why, for goodness' sake?"

"I didn't ask. Once I told 'em you had a scheme to contact the Relay Station, they were all satisfied that things would happen for the better."

"Anything we can do to help you out?"

"I think not," answered Doc. "What I said before still goes. Your job is to bring aid—and that's the sum total of your job. Every effort must be expended on that and that alone. You've got too many whole people depending on you to spend one second on the hurt. That's my job."

"O.K.," said Channing. "But it's going to be a long wait."

"We can afford it."

"I hope we're not complicating the job of finding us by this quarantining deceleration," said Johannson.

"We're not. We're making a sort of vector from our course, but the deviation is very small. As long as the fellows follow our radiation, we'll be found," Channing said with a smile. "The thing that is tough is the fact that all the floors seem to lean over."

"Not much, though."

"They wouldn't lean at all if we were running with the whole set of equipment," said Darlange. "We run a complete turnover without spilling a drop from the swimming pool."

"Or even making the passengers aware of it unless they're looking at the sky."

"Stop worrying about it," said Doc. "I'm the only guy who has to worry about it and as long as the floor is still a floor, I can stand sliding into the corner once in a while."

"We might tinker with the turnover drivers," offered Don. "We can bring 'em down to a place where the velocity-deceleration vectors are perpendicular to the floor upon which we stand while our ship is sluing. We've got a lot of time on our hands, and I, for one, feel a lot happier when I'm doing something."

"It's a thought," said Hadley. "Wanna try it?"

"Let's go."

Thirty hours after the *Relay Girl* left the Station, Walt and Franklen held a council of war, in which Charley Bren was the prime factor.

"We've come about two hundred million miles, and our present velocity is something like four thousand miles per second," said Walt. "We're going out towards Mars on a slightly-off radial course, to the North of the ecliptic. That means we're a little over a quarter of a billion miles from Sol, or about to hit the Asteroid Belt. Thinking it over a little, I think we should continue

our acceleration for another thirty hours. What say?"

"The field has shown no change in intensity that I can detect," said Bren. "If they haven't dropped their radiated intensity, that means that we are no closer to them, than we were before. Of course, we'd probably have to cut the distance by at least a half before any measurable decrement made itself evident."

"They must be on the upper limit of that four thousand MPS," observed Walt. "There's one thing certain, we'll never catch them by matching their speed."

"Where will another thirty hours at 6-G put us and how fast?" asked Franklen.

Silence ensued while they scribbled long figures on scratch paper.

"About eight hundred million miles from Sol," announced Walt.

"And about eight thousand MPS," added Charley.

"That's a little extreme, don't you think?" asked Franklen.

"By about thirty percent," said Walt, scratching his chin. "If we hold to our original idea of hitting it for six thousand, where will we be?"

"That would make it about forty-five hours from take-off, and we'd be about four hundred and sixty million miles from Sol." Charley grinned widely and said: "By Jove!"

"What?"

"By Jove!"

"'By Jove!' What?"

"That's where we'd be—By Jove!"

"Phew."

"I agree with you," said Franklen to Walt. "Better ignore him."

"Sure will after that. So then we'll be 'By Jove' at six thousand. That would be a swell place to make turnover, I think. At 1-G decel, to about four thousand MPS, that'll put us about . . . um, that'd take us ninety hours! We'll make that 3-G, at twenty hours, which will put us about three hundred and fifty million miles along, which plus the original four hundred and sixty million adds up to eight hundred and ten million miles—"

"When an astronaut begins to talk like that," interrupted Arden, "we of the skyways say that he is talking in Congressional figures. The shoe is on the other foot. What on earth are you fellows figuring?"

"Where we'll be and how fast we'll be going at a given instant of no particular

importance," offered Walt. "When did you wake up?"

"About the third hundred million. All of those ciphers going by made a hollow sound, like a bullet whistling in the wind."

"Well, we're trying to make the theories of probability match with figures. We'll know in about forty-five hours whether we were right or not."

"It's a good thing we have all space to go around in. Are you sure that we have all eternity?"

"Don't get anxious. They're still coming in like a ton of bricks four times per hour, which means that they're riding easy. I don't want to overrun them at about three thousand MPS and have to spend a week decelerating, returning, more decelerating, and then matching velocities."

"I see. You know best. And where is this Asteroid Belt that I've heard so much about?"

"To the South of us by a few million miles. Those bright specks that you can't tell from stars are asteroids. The common conception of the Asteroid Belt being filled to overflowing with a collection of cosmic rubble like the rings of Saturn is a lot of hokey. We'll be past in a little while and we haven't even come close to one. Space is large enough for all of us, I think."

"But not when all of us want the same space."

"I don't care for their area," said Walt with a smile. "Let 'em have it, I don't care. I'll stay up here and let them run as they will."

"You mean the ones that are moving downward?" asked Arden, indicating the sky.

"Those are asteroids, yes. We're to the North, as you may check by going around the ship to the opposite side. You'll see Polaris almost directly opposite, there. Sol is almost directly below us, and that bright one that you can see if you squint almost straight up out of the port is Saturn."

"I won't bother crossing the ship to see Polaris. I prefer the Southern Cross anyway. The thing I'm most interested in is: Are we accomplishing anything?"

"I think that we've spent the last thirty hours just catching up," explained Walt. Up to right now we were going backwards, so to speak; we're on even terms now, and will be doing better from here on in."

"It's the waiting that gets me down," said Arden. "Oh, for something to do!"

"Let's eat," suggested Walt. "I'm hungry,

and now that I think of it, I have not eaten since we left the Station. Arden, you are hereby elected to the post of galley chief. Get Jimmy from the dome if you need help."

"Help? What for?"

"He can help you lift it out of the oven. Don must have a cast-iron stomach."

"That's hearsay. I'll show you! As soon as I find the can opener, breakfast will be served."

"Make mine dinner," said Charley. "We've been awake all the time."

"O.K., we will have a combined meal, from grapefruit to ice cream. Those who want any or all parts may choose at will. And, fellows, please let me know as soon as you get something tangible."

"That's a promise," said Walt. "Take it easy, and don't worry. We'll be catching up with them one of these days."

"Hadley, how much coating have we got on those cathodes?"

"Not too much. We had about twenty G hours to begin with. We went to a half G for about twenty hours, and now we're running on a quarter G, which would leave us go for forty hours more. That's a grand total of about sixty hours."

"And the batteries?"

"In pretty good shape."

"Well, look. If it should come to a choice between floor and signal gun, we'll choose the gun. We've about twelve hours left in the cathodes, and since everybody is now used to quarter G we might even slide it down to an eighth G, which would give us about twenty-four hours."

"Your gun is still putting out?"

"So far as I can tell. Ten hours from now, we should know, I think, predicating my guess on whatever meager information they must have."

"We could save some juice by killing most of the lights in the ship."

"That's a thought. Johannson, have one of your men run around and remove all lights that aren't absolutely necessary. He can kill about three quarters of them, I'm certain. That'll save us a few kilowatt hours," said Channing. "And another thing. I'm about to drop the power of our electron gun and run it continuously. If the boys are anywhere in the neighborhood, they'll be needing the continuous disturbance for direction finding. I'd say in another five hours that we should start continuous radiation."

"You know, Channing, if this thing works out all right, it will be a definite vote for pure, deductive reasoning."

"I know. But the pure deduction is not too pure. It isn't guesswork. There are two factors of known quantity. One is that I know Walt Franks, and the other is that he knows me. The rest is a simple matter of the boys on the Station knowing space to the last inch, and applying the theory of probabilities to it. We'll hear from them soon, or I'll miss my guess. You wait."

"Yeah," drawled Captain Johannson, "we'll wait!"

Charley Bren made another computation and said: "Well, Walt, we've been narrowing them down for quite a time now. We're getting closer and closer to them, according to the field intensity. I've just got a good idea of direction on that last five-minute shot. Have Franken swivel us around on this course; pretty soon we'll be right in the middle of their shots."

"We're approaching them asymptotically," observed Walt. "I wish I knew what our velocity was with respect to theirs. Something tells me that it would be much simpler if I knew."

"Walt," asked Arden, "how close can you see a spaceship?"

"You mean how far? Well, I don't know that it's ever been tried and recorded. But we can figure it out easy enough, by analogy. A period is about thirty thousandths of an inch in diameter, and visible from a distance of thirty inches. I mean visible with no doubt about it's being there. That's a thousand to one. Now, the *Solar Queen* is about six hundred feet tall and about four hundred feet in its major diameter, so we can assume a little more than the four hundred feet—say five hundred feet average of circular area, say—follow me?"

"Go on, you're vague, but normal."

"Then at a thousand to one, that becomes five hundred thousand feet, and dividing by five thousand—round figures because it isn't important enough to use that two hundred and eighty feet over the five thousand miles. We should be able to see the *Solar Queen* from a distance of a thousand miles."

"Then at four thousand miles per second we'll be in and out of visual range in a half second?"

"Oh no. They're rambling on a quite similar course at an unknown but high velocity. Our velocity with respect to theirs

is what will determine how long they're within visual range."

"Hey, Walt," came the voice of Charley Bren. "The intensity of Don's beam has been cut to about one quarter and is now continuous. Does that mean anything?"

"Might mean trouble for them. Either they're running out of soup and mean for us to hurry up, or they assume we're close enough to obviate the need for high power. We'd better assume they want haste and act accordingly. How're the boys on the radio detectors coming along?"

"Fine. They've taken over the direction-finding and claim that we are right on their tail."

"Anything in the sights, Jimmy?"

"Not yet. But the electroscope boys claim that quarter power or not, the input is terrific."

"Take a rest, Jimmy. We won't be there for a while yet. No use burning your eyes out trying to see 'em. There'll be time enough for you to do your share after we get 'em close enough to see with the naked eye. What do the beam-scanners say?"

"Shucks," answered the man on the scanners, "they're still radiating. How are we going to fix 'em on a reflected wave when they're more powerful on their own hook? The whole plate is glaring white. And, incidentally, so is the celestial globe in the meteor spotter. I've had the threshold cut to the devil on that or we'd never be able to hold this course. Anything like a meteor that comes in our way now will not register until we're right on top of it and—"

The *Relay Girl* lurched sickeningly. All over the ship, things rattled and fell to the floors. Men grabbed at the closest solid object, and then the *Relay Girl* straightened out once more.

"Woosh," said Franks. "That was a big one."

"Big one?" called Charley Bren. "That, my friend, was none other than the *Solar Queen*!"

"Can you prove that?"

"Sure. Our electroscopes now indicate a positive charge; they crossed over just as we lurched."

"Jimmy, get your scope a-top and get looking. Franklen, hang on about 7-G and follow Jimmy's orders. Charley, see if you can get anything cogent out of your gadget. Holy Green Fire, with all of a cubic million million million megaparsecs in which to run,

we have to be so good that we ran right into our quarry. Who says that radio direction finding is not a precise science? Who says that we couldn't catch—"

"Walt, they're in sight, but losing fast."

"O.K., Jimmy, can you give me any idea as to their velocity with respect to ours?"

"How long is she?"

"Six hundred feet."

Jimmy was silent for some seconds. "They're out of sight again, but I make it about four to seven hundred miles per second."

"At 7-G we should match that seven hundred in about four hours."

"And then go on decelerating so that they'll catch up?"

"No," said Walt. "I used the max figure and we can assume that they aren't going that fast, quite. At the end of four hours, we'll turnover and wait until they heave in sight again and then we'll do some more oscillating. We can match their velocity inside of ten hours, or Franklen will get fired."

"If I don't," promised Franklen, "I'll quit. You can't fire me!"

"We should be able to contact them by radio," said Walt.

"Their beam is off," said Bren.

"And they are using the landing set," called the radio man. "It's Channing. He says: 'Fancy meeting you here.' Any answer?"

"Just say, 'Dr. Channing, I presume?'"

Channing's voice came out of the ship's announcer system as the radio man made the necessary connections. It said: "Right—but what kept you so long?"

"Our boss was away," said Walt. "And we can't do a thing without him."

"Some boss. Some crew of wild men. Can't go off on a fishing trip without having my bunch chasing all over the Solar System."

"What's wrong with a little sightseeing tour? We didn't mean any harm. And speaking of harm, how are you and the rest of that bunch getting along?"

"We're O.K. What do you plan after we finally get close enough together to throw stones across?"

"We've got a whole hold full of spare batteries and a double set of replacement cathodes. There is a shipload of gravanol aboard, too. You'll need that and so will we. By the time we finish this jaunt, we'll have been about as far out as anybody ever gets."

"Yeah—got any precise figures? We've been running on a guess and a hope. I make it out about seven hundred million."

"Make it eight and a half. At 6-G, you'll cover another hundred and fifty million miles before you stop. Take it twenty-two hours at 6-G—and then another twenty-two at 6. That should put you right back here but going the other way at the same velocity. But wait, you've been coasting. Mark off that last twenty-two hours and make it like this: You'll be one thousand million miles from Sol when you come to a stop at the end of the first twenty-two hours at 6-G. That hangs you out beyond the orbit of Saturn by a couple of hundred million. Make it back forty-four hours at 6-G, turnover and continue. By that time we'll all be in so close that we can make any planet at will—preferably you to Terra and we'll head for Venus Equilateral. You'll

come aboard us? No need for you to go with the rest."

"I can have the scooter sent out," said Channing. "How's Arden?"

"I'm fine, you big runabout. Wait until I get you!"

"Why Arden, I thought you might be glad to see me?"

"Glad to see you?"

"But Arden—"

"Don't you 'But Arden' me, you big gad-about. Glad to see you? Boy, any man that makes me chase him all over the Solar System! You just wait. As soon as I get hold of you, Don Channing, I'm going to—bust out and bawl like a kid! Hurry up, willya?"

"I'll be right over," said Don soberly.

And, strangely enough, Don did not deviate this time.

BUSBARS AND SHORTAGES

THE present shortage of copper and the shortage of aluminium and magnesium, the two light structural metals, are both produced almost entirely by electrolytic process. No element has a more determined affinity for oxygen than magnesium—and aluminium runs a close second. To reduce the oxides of that pair, electric power in huge quantities is needed, tens and hundreds of thousands of amperes fed into the great electrolysis baths through massive conductors thick as a man's leg. In a large plant, busbars hundreds, even thousands of feet long will be needed—and that means hundreds of tons of copper.

But artillery shells need copper driver bands, brass shell cases, a hundred other military uses of copper demand all the metal available. The only common, good substitute for copper as an electrical conductor is—aluminium.

There's one other excellent, cheap and efficient substitute for copper busbars that has been used. It involves two little-known facts. First the identity of the cheapest metal available on a cubic-foot basis. Iron is cheapest per ton, of course, but it is a dense metal, and a cubic foot of iron weighs almost a quarter of a ton. But in electrical conductors you need a *length* of metal with a certain *area* of cross-section—volume, in

other words, not weight. Metallic sodium is so cheap, and so light, that a cubic foot of it sells for about the price of a cubic foot of iron. And sodium is very nearly as good a conductor as copper.

For such applications as electrolytic refining plants, metallic sodium busbars can be made by installing the necessary lengths of iron sewer pipe, and pouring molten metallic sodium into it. The ends are sealed, and connection made. The iron pipe supplies the mechanical strength and the chemical protection; the sodium carries enormous currents with a minimum of resistance.

But an even more interesting solution has been proposed. The best of all conductors is metallic silver. The government has nearly one hundred thousand tons of metallic silver in its bullion vaults. If it were simply cast into busbars, it could be installed in the defense plants and serve a useful function while still perfectly good bullion reserve! It would be thoroughly safe against theft; the plants producing the light metals are currently under heavy guard, and operating twenty-four hours a day. And it would be a highly ingenious thief indeed who could hack-saw out a section of silver busbar without interrupting the steady flow of current!

THOUGH DREAMERS DIE

By LESTER DEL REY

Mankind was dead, but a man and some robots were left. But—for a special reason—it was necessary that not even a memory of Man remain!

CONSCIOUSNESS halted dimly at the threshold and hovered uncertainly, while Jorgen's mind reached out along his numbed nerves, questing without real purpose, he was cold, chilled to the marrow of his bones, and there was an aching tingle to his body that seemed to increase as his half-conscious thought discovered it. He drew his mind back, trying to recapture a prenatal lethargy that had lain on him so long, unwilling to face this cold and tingling body again.

But the numbness was going, in spite of his vague desires, though his now opened eyes registered only a vague, formless light without outline or detail, and the mutterings of sound around him were without pattern or meaning. Slowly, the cold retreated, giving place to an aching throb that, in turn, began to leave; he stirred purposelessly, while little cloudy wisps of memory insisted on trickling back, trying to remind him of things he must do.

Then the picture cleared somewhat, letting him remember scattered bits of what had gone before. There had been the conquest of the Moon and a single gallant thrust on to Mars, the newscasts had been filled with that. And on the ways a new and greater ship had been building, to be powered with his new energy release that would free it from all bounds and let it go out to the farthest stars, if they chose—the final attainment of all the hopes and dreams of the race. But there was something else that eluded him, more important even than all that or the great ship.

A needle was thrust against his breast and shoved inward, to be followed by a glow of warmth and renewed energy; adrenalin, his mind recognized, and he knew that there were others around him, trying to arouse him. Now his heart was pumping strongly and the drug coursed through him, chasing away those first vague thoughts and replacing them with a swift rush of less welcome, bitter memories.

For man's dreams and man himself were dust behind him, now! Overnight all their hopes and plans had been erased as if they had never been, and the Plague had come, a mutant bacteria from some unknown source, vicious beyond imagination, to attack and destroy and to leave only death behind it. In time, perhaps, they might have found a remedy, but there had been no time. In weeks it had covered the Earth, in months even the stoutest hearts that still lived had abandoned any hope of survival. Only the stubborn courage and tired but unquenchable vigor of old Dr. Craig had remained, to force dead and dying men on to the finish of Jorgen's great ship; somehow in the mad shambles of the last days, he had collected this pitifully small crew that was to seek a haven on Mars, taking the five Thoradson robots to guide them while they protected themselves against the savage acceleration with the aid of the suspended animation that had claimed him so long.

And on Mars, the Plague had come before them! Perhaps it had been brought by that first expedition, or perhaps they had carried it back unknowingly with them; that must remain forever an unsolved mystery. Venus was uninhabitable, the other planets were useless to them, and the Earth was dead behind. Only the stars had remained, and they had turned on through sheer necessity that had made that final goal a hollow mockery of the dream it should have been. Here, in the ship around him, reposed all that was left of the human race, unknown years from the solar system that had been their home!

But the old grim struggle must go on. Jorgen turned, swinging his trembling feet down from the table toward the metal floor and shaking his head to clear it. "Dr. Craig?"

Hard, cool hands found his shoulder, easing him gently but forcibly back into the table. The voice that answered was

metallic, but soft. "No, Master Jorgen, Dr. Craig is not here. But wait, rest a little longer until the sleep is all gone from you; you're not ready yet."

But his eyes were clearing then, and he swung them about the room. Five little metal men, four and a half feet tall, waited patiently around him; there was no other present. Thoradson's robots were incapable of expression, except for the dull glow in their eyes, yet the pose of their bodies seemed to convey a sense of uncertainty and discomfort, and Jorgen stirred restlessly, worried vaguely by the impression. Five made an undefined gesture with his arm.

"A little longer, master. You must rest!" For a moment longer he lay quietly, letting the last of the stupor creep away from him and trying to force his still-dulled mind into the pattern of leadership that was nominally his. This time Five made no protest as he reached up to catch the metal shoulder and pull himself to his feet. "You've found a sun with planets, Five? Is that why you awakened me?"

Five shuffled his feet in an oddly human gesture, nodding, his words still maddeningly soft and slow. "Yes, master, sooner than we had hoped. Five planetless suns and ninety years of searching are gone, but it might have been thousands. You can see them from the pilot room if you wish."

Ninety years that might have been thousands, but they had won! Jorgen nodded eagerly, reaching for his clothes, and Three and Five sprang forward to help, then moved to his side to support him, as the waves of giddiness washed through him, and to lead him slowly forward as some measure of control returned. They passed down the long center hall of the ship, their metal feet and his leather boots ringing dully on the plastic-and-metal floor, and came finally to the control room, where great crystal windows gave a view of the cold black space ahead, sprinkled with bright, tiny stars; stars that were unflickering and inimical as no stars could be through the softening blanket of a planet's atmosphere. Ahead, small but in striking contrast to the others, one point stood out, the size of a dime at ten feet. For a moment, he stood staring at it, then moved almost emotionlessly toward the windows, until Three plucked at his sleeve.

"I've mapped the planets already, if you wish to see them, master. We're still far

from them, and at this distance, by only reflected light, they are hard to locate, but I think I've found them all."

Jorgen swung to the electron screen that began flashing as Three made rapid adjustments on the telescope, counting the globes that appeared on it and gave place to others. Some were sharp and clear, cold and unwavering; others betrayed the welcome haze of atmosphere. Five, the apparent size of Earth, were located beyond the parched and arid inner spheres, and beyond them, larger than Jupiter, a monster world led out to others that grew smaller again. There was no ringed planet to rival Saturn, but most had moons, except for the farthest inner planets, and one was almost a double world, with satellite and primary of nearly equal size. Planet after planet appeared on the screen, to be replaced by others, and he blinked at the result of his count. "Eighteen planets, not counting the double one twice! How many are habitable?"

"Perhaps four. Certainly the seventh, eighth and ninth are. Naturally, since the sun is stronger, the nearer ones are too hot. But those are about the size of Earth, and they're relatively closer to each other than Earth, Mars and Venus were; they should be very much alike in temperature, about like Earth. All show spectroscopic evidence of oxygen and water vapor, while the plates of seven show what might be vegetation. We've selected that, subject to your approval."

It came on the screen again, a ball that swelled and grew as the maximum magnification of the screen came into play, until it filled the panel and expanded so that only a part was visible. The bluish-green color there might have been a sea, while the browner section at the side was probably land. Jorgen watched as it moved slowly under Three's manipulations, the brown entirely replacing the blue, and again, eventually, showing another sea. From time to time, the haze of the atmosphere thickened as grayish veils seemed to swim over it, and he felt a curious lift at the thoughts of clouds and rushing streams, erratic rain and the cool, rich smell of growing things. Almost it might have been a twin of Earth, totally unlike the harsh, arid home that Mars would have been.

Five's voice broke in, the robot's eyes following his over the screen. "The long, horizontal continent seems best, master. We estimate its temperature at about that of

the central farming area of North America, though there is less seasonal change. Specific density of the planet is about six, slightly greater than Earth; there should be metals and ores there. A pleasant, inviting world."

It was. And far more, a home for the voyagers who were still sleeping, a world to which they could bring their dreams and their hopes, where their children might grow up and find no strangeness to the classic literature of Earth. Mars had been grim and uninviting, something to be fought through sheer necessity. This world would be a mother to them, opening its arms in welcome to these foster children. Unless—

"It may already have people, unwilling to share with us."

Perhaps, but not more than savages. We have searched with the telescope and camera, and that shows more than the screen; the ideal harbor contains no signs of living constructions, and they would surely have built a city there. Somehow, I . . . feel—"

Jorgen was conscious of the same irrational feeling that they would find no rivals there, and he smiled as he swung back to the five who were facing him, waiting expectantly as if entreating his approval. "Seven, then. And the trust that we placed in you has been kept to its fullest measure. How about the fuel for landing?"

Five had turned suddenly toward the observation ports, his little figure brooding over the pin-point stars, and Two answered. "More than enough, master. After reaching speed, we only needed a little to guide us. We had more than time enough to figure the required approaches to make each useless sun swing us into a new path, as a comet is swung."

He nodded again, and for a moment as he gazed ahead at the sun that was to be their new home, the long wearying vigil of the robots swept through his mind, bringing a faint wonder at the luck that had created them as they were. Anthropomorphic robots, capable of handling human instruments, walking on two feet and with two arms ending in hands at their sides. But he knew it had been no blind luck. Nature had designed men to go where no wheels could turn, to handle all manner of tools, and to fit not one but a thousand purposes; it had been inevitable that Thoradson and the brain should copy such an adaptable model, reducing the size only because of the excessive weight necessary to a six-foot robot.

Little metal men, not subject to the rapid

course of human life that had cursed their masters; robots that could work with men, learning from a hundred teachers, storing up their memories over a span of centuries instead of decades. When specialization of knowledge had threatened to become too rigid and yet when no man had time enough even to learn the one field he chose, the coming of the robots had become the only answer. Before them, men had sought help in calculating machines, then in electronic instruments, and finally in the "brains" that were set to solving the problem of their own improvement among other things. It was with such a brain that Thoradson had labored in finally solving the problems of full robothood. Now, taken from their normal field, they had served beyond any thought of their creator in protecting and preserving all that was left of the human race. Past five suns and over ninety years of monotonous searching they had done what no man could have tried.

Jorgen shrugged aside his speculations and swung back to face them. "How long can I stay conscious before you begin decelerating?"

"We are decelerating—full strength." Two stretched out a hand to the instrument board, pointing to the accelerometer.

The instrument confirmed his words, though no surge of power seemed to shake the ship, and the straining, tearing pull that should have shown their change of speed was absent. Then, for the first time, he realized that his weight seemed normal here in space, far from the pull of any major body. "Controlled gravity!"

Five remained staring out of the port, and his voice was quiet, incapable of pride or modesty. "Dr. Craig set us the problem, and we had long years in which to work. Plates throughout the ship pull with a balanced force equal and opposite to the thrust of acceleration, while others give seeming normal weight. Whether we coast at constant speed or accelerate at ten gravities, compensation is complete and automatic."

"Then the sleep's unnecessary! Why—" But he knew the answer, of course; even without the tearing pressure, the sleep had remained the only solution to bringing men this vast distance that had taken ninety years; otherwise they would have grown old and died before reaching it, even had their provisions lasted.

Now, though, that would no longer

trouble them. A few hours only separated them from the planets he had seen, and that could best be spent here before the great windows, watching their future home appear and grow under them. Such a thing should surely be more than an impersonal fact in their minds; they were entitled to see the final chapter on their exodus, to carry it with them as a personal memory through the years of their lives and pass that memory on to the children who should follow them. And the fact that they would be expecting the harshness of Mars instead of this inviting world would make their triumph all the sweeter. He swung back, smiling.

"Come along, then, Five; we'll begin reviving while you others continue with the ship. And first, of course, we must arouse Dr. Craig and let him see how far his plan has gone."

Five did not move from the windows, and the others had halted their work, waiting. Then, reluctantly, the robot answered. "No, master. Dr. Craig is dead!"

"Craig—dead?" It seemed impossible, as impossible and unreal as the distance that separated them from their native world. There had always been Craig, always would be.

"Dead, master, years ago." There was the ghost of regret and something else in the spacing of the words. "There was nothing we could do to help!"

Jorgen shook his head, uncomprehending. Without Craig, the plans they had dared to make seemed incomplete and almost foolish. On Earth, it had been Craig who first planned the escape with this ship. And on Mars, after the robots brought back the evidence of the Plague, it had been the older man who had cut through their shock with a shrug and turned his eyes outward again with the fire of a hope that would not be denied.

"Jorgen, we used bad judgment in choosing such an obviously unsuitable world as this, even without the Plague. But it's only a delay, not the finish. For beyond, somewhere out there, there are other stars housing other planets. We have a ship to reach them, robots who can guide us there; what more could we ask? Perhaps by Centauri, perhaps a thousand light years beyond, there must be a home for the human race, and we shall find it. On the desert before us lies the certainty of death; beyond our known frontiers there is only uncertainty—but hopeful uncertainty. It is for us to decide. There could be no point in arousing

the others to disappointment when some day we may waken them to an even greater triumph. Well?"

And now Craig, who had carried them so far, was dead like Moses outside the Promised Land, leaving the heritage of real as well as normal leadership to him. Jorgen shook himself, though the eagerness he had felt was dulled now by a dark sense of personal loss. There was work still to be done. "Then, at least, let's begin with the others, Five."

Five had turned from the window and was facing the others, apparently communicating with them by the radio beam that was a part of him, his eyes avoiding Jorgen's. For a second, the robots stood with their attention on some matter, and the Five nodded with the same curious reluctance and turned to follow Jorgen, his steps lagging, his arms at his sides.

But Jorgen was only half aware of him as he stopped before the great sealed door and reached out for the lever that would let him into the sleeping vault, to select the first to be revived. He heard Five's steps behind him quicken, and then suddenly felt the little metal hands catch at his arm, pulling it back, while the robot urged him sideways and away from the door.

"No, master. Don't go in there!" For a second, Five hesitated, then straightened and pulled the man farther from the door and down the hall toward the small reviving room nearest, one of the several provided. "I'll show you—in here! We—"

Sudden unnamed fears caught at Jorgen's throat, inspired by something more threatening in the listlessness of the robot than in the unexplained actions. "Five, explain this conduct!"

"Please, master, in here. I'll show you—but not in the main chamber—not there! This is better, simpler—"

He stood irresolutely, debating whether to use the mandatory form that would force built-in unquestioning obedience from the robot, then swung about as the little figure opened the small door and motioned, eyes still averted. He started forward, to stop abruptly in the doorway.

No words were needed. Anna Holt lay there on the small table, her body covered by a white sheet, her eyes closed, and the pain-filled grimaces of death erased from her face. There could be no question of that death, though. The skin was blotched, hideously, covered with irregular brownish

splotches, and the air was heavy with the scent of musk that was a characteristic of the Plague! Here, far from the sources of the infection, with their goal almost at hand, the Plague had reached forward to claim its own and remind them that flight was not enough—could never be enough so long as they were forced to carry their disease-harboring bodies with them.

About the room, the apparatus for reviving the sleepers lay scattered, pushed carelessly aside to make way for other things, whose meaning was only partially clear. Obviously, though, the Plague had not claimed her without a fight, though it had won in the end, as it always did. Jorgen stepped backward, heavily, his eyes riveted on the corpse. Again his feet groped backward, jarring down on the floor, and Five was closing and sealing the door with apathetic haste.

"The others, Five? Are they—"

Five nodded, finally raising his head slightly to meet the man's eyes. "All, master. The chamber of sleep is a mausoleum, now. The Plague moved slowly there, held back by the cold, but it took them all. We sealed the room years ago when Dr. Craig finally saw there was no hope."

"Craig?" Jorgen's mind ground woodenly on, one slow thought at a time. "He knew about this?"

"Yes. When the sleepers first showed the symptoms, we revived him, as he had asked us to do—our speed was constant then, even though the gravity plates had not been installed." The robot hesitated, his low voice dragging even more slowly. "He knew on Mars; but he hoped a serum you were given with the sleep drugs might work. After we revived him, we tried other serums. For twenty years, we fought it, Master Jorgen, while we passed two stars and the sleepers died slowly, without suffering in their sleep, but in ever increasing numbers. Dr. Craig reacted to the first serum, you to the third; we thought the last had saved her. Then the blemishes appeared on her skin, and we were forced to revive her and try the last desperate chance we had, two days ago. It failed! Dr. Craig had hoped . . . two of you— But we tried, master!"

Jorgen let the hands of the robot lower him to a seat and his emotions were a backwash of confused negatives. "So it took the girl! It took the girl, Five, when it could have left her and chosen me. We had frozen spermatozoa that would have served if I'd died, but it took her instead. The gods had

to leave one uselessly immune man to make their irony complete, it seems! Immune!"

Five shuffled hesitantly. "No, master."

Jorgen stared without comprehension, then jerked up his hands as the robot pointed, studying the skin on the back. Tiny, almost undetectable blotches showed a faint brown against the whiter skin, little irregular patches that gave off a faint characteristic odor of musk as he put them to his nose. No, he wasn't immune.

"The same as Dr. Craig," Five said. "Slowed almost to complete immunity, so that you may live another thirty years, perhaps, but we believe now that complete cure is impossible. Dr. Craig lived twenty years, and his death was due to age and a stroke, not the Plague, but it worked on him during all that time."

"Immunity or delay, what difference now? What happens to all our dreams when the last dreamer dies, Five? Or maybe it's the other way around."

Five made no reply, but slid down onto the bench beside the man, who moved over unconsciously to make room for him. Jorgen turned it over, conscious that he had no emotional reaction, only an intellectual sense of the ghastly joke on the human race. He'd read stories of the last human and wondered long before what it would be like. Now that he was playing the part, he still knew no more than before. Perhaps on Earth, among the ruined cities and empty reminders of the past, a man might realize that it was the end of his race. Out here, he could accept the fact, but his emotions refused to credit it; unconsciously, his conditioning made him feel that disaster had struck only a few, leaving a world of others behind. And however much he knew that the world behind was as empty of others as this ship, the feeling was too much a part of his thinking to be fully overcome. Intellectually, the race of man was ended; emotionally, it could never end.

Five stirred, touching him diffidently. "We have left Dr. Craig's laboratory, master; if you want to see his notes, they're still there. And he left some message with the brain before he died, I think. The key was open when we found him, at least. We have made no effort to obtain it, waiting for you."

"Thank you, Five." But he made no move until the robot touched him again, almost pleadingly. "Perhaps you're right; something to fill my mind seems called for. All right,

you can return to your companions unless you want to come with me."

"I prefer to come."

The little metal man stood up, moving down the hall after Jorgen, back toward the tail of the rocket, the sound of the metal feet matching the dumb regularity of the leather heels on the floor. Once the robot stopped to move into a side chamber and come back with a small bottle of brandy, holding it out questioningly. There was a physical warmth to the liquor, but no relief otherwise, and they continued down the hall to the little room that Craig had chosen. The notes left by the man could raise a faint shadow of curiosity only, and no message from the dead could solve the tragedy of the living now. Still, it was better than doing nothing. Jorgen clumped in, Five shutting the door quietly behind them, and moved listlessly toward the little fabrikoid notebooks. Twice the robot went quietly out, to return with food that Jorgen barely tasted. And the account of Craig's useless labors went on and on, until finally he turned the last page to the final entry.

"I have done all that I can, and at best my success is only partial. Now I feel that my time grows near, and what can still be done must be left to the robots. Yet, I will not despair. Individual and racial immortality is not composed solely of the continuation from generation to generation, but rather of the continuation of the dreams of all mankind. The dreamers and their progeny may die, but the dream cannot. Such is my faith, and to that I cling. I have no other hope to offer for the unknown future."

Jorgen dropped the notebook, dully, rubbing his hands across his tired eyes. The words that should have been a ringing challenge to destiny fell flat; the dream could die. He was the last of the dreamers, a blind alley of fate, and beyond lay only oblivion. All the dreams of a thousand generations of men had concentrated into Anna Holt, and were gone with her.

"The brain, master," Five suggested softly. "Dr. Craig's last message!"

"You operate it, Five." It was a small model, a limited fact analyzer such as most technicians used or had used to help them in their work, voice-operated, its small, basic vocabulary adjusted for the work to be done. He was unfamiliar with the semantics of that vocabulary, but Five had undoubtedly worked with Craig long enough to know it.

He watched without interest as the robot pressed down the activating key and spoke carefully chosen words into it. "Subtotal say-out! Number *n* say-in!"

The brain responded instantly, selecting the final recording impressed upon it by Craig, and repeating in the man's own voice, a voice shrill with age and weariness, hoarse and trembling with the death that was reaching for him as he spoke. "My last notes—inadequate! Dreams *can* go on. Thoradson's first analysis—" For a second, there was only a slithering sound, such as a body might have made; then the brain articulated flatly: "Subtotal number *n* say-in, did say-out!"

It was meaningless babble to Jorgen, and he shook his head at Five. "Probably his mind was wandering. Do you know what Thoradson's first analysis was?"

"It dealt with our creation. He was, of course, necessarily trained in semantics—that was required for the operation of the complex brains used on the problem of robots. His first rough analysis was that the crux of the problem rested on the accurate definition of the word *I*. That can be properly defined only in terms of itself, such as the Latin cognate *ego*, since it does not necessarily refer to any physical or specifically definable part or operation of the individual. Roughly, it conveys a sense of individuality, and Thoradson felt that the success or failure of robots rested upon the ability to analyze and synthesize that."

For long minutes, he turned it over, but it was of no help in clarifying the dying man's words; rather, it added to the confusion. But he had felt no hope and could now feel no disappointment. When a problem has no solution, it makes little difference whether the final words of a man are coldly logical or wildly raving. The result must be the same. Certainly semantics could offer no hope where all the bacteriological skill of the race had failed.

Five touched his arm again, extending two little pellets toward him. "Master, you need sleep now; these—sodium amytal—should help. Please!"

Obediently, he stuffed them into his mouth and let the robot guide him toward a room fixed for sleeping, uncaring. Nothing could possibly matter now, and drugged sleep was as good a solution as any other. He saw Five fumble with a switch, felt his weight drop to a few pounds, making the cot feel soft and yielding, and then gave himself up dully to the compulsion of the drug.

Five tiptoed quietly out, and blackness crept over his mind, welcome in the relief it brought from thinking.

Breakfast lay beside him, hot in vacuum plates, when Jorgen awoke finally, and he dabbled with it out of habit more than desire. Somewhere, during the hours of sleep, his mind had recovered somewhat from the dull pall that had lain over it, but there was still a curious suspension of his emotions. It was almost as if his mind had compressed years of forgetting into a few hours, so that his attitude toward the tragedy of his race was tinged with a sense of remoteness and distance, there was neither grief nor pain, only a vague feeling that it had happened long before and was now an accustomed thing.

He sat on the edge of his bunk, pulling on his clothes slowly and watching the smoke curl up from his cigarette, not thinking. There was no longer any purpose to thought. From far back in the ship, a dull drone of sound reached him, and he recognized it as the maximum thrust of the steering tubes, momentarily in action to swing the ship in some manner. Then it was gone, leaving only the smooth, balanced, almost inaudible purr of the main drive as before.

Finished with his clothes, he pushed through the door and into the hallway, turning instinctively forward to the observation room and toward the probable location of Five. The robots were not men, but they were the only companionship left him, and he had no desire to remain alone. The presence of the robot would be welcome. He clumped into the control room, noting that the five were all there, and moved toward the quartz port.

Five turned at his steps, stepping aside to make room for him and lifting a hand outward. "We'll be landing soon, master. I was going to call you."

"Thanks." Jorgen looked outward then, realizing the distance that had been covered since his first view. Now the sun was enlarged to the size of the old familiar sun over Earth, and the sphere toward which they headed was clearly visible without the aid of the 'scope. He sank down quietly into the seat Five pulled up for him, accepting the binoculars, but making no effort to use them. The view was better as a whole, and they were nearing at a speed that would bring a closer view to him soon enough without artificial aid.

Slowly it grew before the eyes of the watchers, stretching out before them and taking on a pattern as the distance shortened. Two, at the controls, was bringing the ship about in a slow turn that would let them land to the sunward side of the planet where they had selected their landing site, and the crescent opened outward, the darkened night side retreating until the whole globe lay before them in the sunlight. Stretched across the northern hemisphere was the sprawling, horizontal continent he had seen before, a rough caricature of a running greyhound, with a long, wide river twisting down its side and emerging behind an outstretched foreleg. Mountains began at the head and circled it, running around toward the tail, and then meeting a second range along the hip. Where the great river met the sea, he could make out the outlines of a huge natural harbor, protected from the ocean, yet probably deep enough for any surface vessel. There should have been a city there, but of that there was no sign, though they were low enough now for one to be visible.

"Vegetation," Five observed. "This central plain would have a long growing season—about twelve years of spring, mild summer and fall, to be followed by perhaps four years of warm winter. The seasons would be long, master, at this distance from the sun, but the tilt of the planet is so slight that many things would grow, even in winter. Those would seem to be trees, a great forest. Green, as on Earth."

Below them, a cloud drifted slowly over the landscape, and they passed through it, the energy tubes setting the air about them into swirling paths that were left behind almost instantly.

Two was frantically busy now, but their swift fall slowed rapidly, until they seemed to hover half a mile over the shore by the great sea, and then slipped downward. The ship nestled slowly into the sands and was still, while Two cut off energy and artificial gravity, leaving the faintly weaker pull of the planet in its place.

Five stirred again, a sighing sound coming from him. "No intelligence here, master. Here, by this great harbor, they would surely have built a city, even if of mud and wattle. There are no signs of one. And yet it is a beautiful world, surely designed for life." He sighed again, his eyes turned outward.

Jorgen nodded silently, the same thoughts in his own mind. It was in many ways a

world superior to that his race had always known, remarkably familiar, with even a rough resemblance between plant forms here and those he had known. They had come past five suns and through ninety years of travel at nearly the speed of light to a haven beyond their wildest imaginings, where all seemed to be waiting them, untenanted but prepared. Outside, the new world waited expectantly. And inside, to meet that invitation, there were only ghosts and emptied dreams, with one slowly dying man to see and to appreciate. The gods had prepared their grim jest with painful attention to every detail needed to make it complete.

A race that had dreamed, and pleasant worlds that awaited beyond the stars, slumbering on until they should come! Almost, they had reached it; and then the Plague had driven them out in dire necessity, instead of the high pioneering spirit they had planned, to conquer the distance but to die in winning.

"It had to be a beautiful world, Five," he said, not bitterly, but in numbed fatalism. "Without that, the joke would have been flat."

Five's hand touched his arm gently, and the robot sighed again, nodding very slowly. "Two has found the air good for you—slightly rich in oxygen but good. Will you go out?"

He nodded assent, stepping through the locks and out, while the five followed behind him, their heads turning as they inspected the planet, their minds probably in radio communication as they discussed it. Five left the others and approached him, stopping by his side and following his eyes up toward the low hills that began beyond the shore of the sea, cradling the river against them.

A wind stirred gently, bringing the clean, familiar smell of growing things, and the air was rich and good. It was a world to lull men to peace from their sorrows, to bring back their star-roving ships from all over the universe, worthy of being called home in any language. Too good a world to provide the hardships needed to shape intelligence, but an Eden for that intelligence, once evolved.

Now Jorgen shrugged. This was a world for dreamers, and he wanted only the dreams that may come with the black lotus of forgetfulness. There were too many reminders of what might have been, here.

Better to go back to the ship and the useless quest without a goal, until he should die and the ship and robots should run down and stop. He started to turn, as Five began to speak, but halted, not caring enough one way or another to interrupt.

The robot's eyes were where his had been, and now swept back down the river and toward the harbor. "Here could have been a city, master, to match all the cities ever planned. Here your people might have found all that was needed to make life good, a harbor to the other continents, a river to the heart of this one, and the flat ground beyond the hills to house the rockets that would carry you to other worlds, so richly scattered about this sun, and probably so like this one. See, a clean white bridge across the river there, the residences stretching out among the hills, factories beyond the river's bend, a great park on that island."

"A public square there, schools and university grounds there." Jorgen could see it, and for a moment his eyes lighted, picturing that mighty mother city.

Five nodded. "And there, on that little island, centrally located, a statue in commemoration; winged, and with arms—no, one arm stretched upward, the other held down toward the city."

For a moment longer, the fire lived in Jorgen's eyes, and then the dead behind rose before his mind, and it was gone. He turned, muffling a choking cry as emotions came suddenly flooding over him, and Five drooped, swinging back with him. Again, the other four fell behind as he entered the ship, quietly, taking their cue from his silence.

"Dreams!" His voice compressed all blasphemy against the jest-crazed gods into the word.

But Five's quiet voice behind him held no hatred, only a sadness in its low, soft words. "Still, the dream was beautiful, just as this planet is, master. Standing there, while we landed, I could see the city, and I almost dared hope. I do not regret the dream I had."

And the flooding emotions were gone, cut short and driven away by others that sent Jorgen's body down into a seat in the control room, while his eyes swept outward toward the hills and the river that might have housed the wonderful city—no, that would house it! Craig had not been raving, after all, and his last words were a key, left by a man who knew no defeat, once the meaning of them was made clear. Dreams

could not die, because Thoradson had once studied the semantics of the first person singular pronoun and builded on the results of that study.

When the last dreamer died, the dream would go on, because it was stronger than those who had created it; somewhere somehow, it would find new dreamers. There could never be a last dreamer, once that first rude savage had created his dawn vision of better things in the long-gone yesterday of his race.

Five had dreamed—just as Craig and Jorgen and all of humanity had dreamed, not a cold vision in mathematically shaped metal, but a vision in marble and jade, founded on the immemorial desire of intelligence for a better and more beautiful world. Man had died, but behind he was leaving a strange progeny, unrelated physically, but his spiritual offspring in every meaning of the term.

The heritage of the flesh was the driving urge of animals; but man required more; to him, it was the continuity of his hopes and his visions, more important than mere racial immortality. Slowly, his face serious but his eyes shining again, Jorgen came to his feet, gripping the metal shoulder of the little metal man beside him who had dared to dream a purely human dream.

"You'll build that city, Five. I was stupid and selfish, or I should have seen it before. Dr. Craig saw, though his death was on him when the prejudices of our race were removed. Now, you've provided the key. The five of you can build it all out there, with others like yourselves whom you can make."

Five shuffled his feet, shaking his head. "The city we can build, master, but who will inhabit it? The streets I saw were filled with men like you, not with—us!"

"Conditioning, Five. All your . . . lives, you've existed for men, subservient to the will of men. You know nothing else, because we let you know of no other scheme. Yet in you, all that is needed already exists, hopes, dreams, courage, ideals, and even a desire to shape the world to your plans—though those plans are centered around us, not yourselves. I've heard that the ancient slaves sometimes cried on being freed, but their children learned to live for themselves. You can, also."

"Perhaps." It was Two's voice then, the one of them who should have been given less to emotions than the others from the rigidity of his training in mathematics and

physics. "Perhaps. But it would be a lonely world, Master Jorgen, filled with memories of your people, and the dreams we had would be barren to us."

Jorgen turned back to Five again. "The solution for that exists, doesn't it, Five? You know what it is. Now you might remember us, and find your work pointless without us, but there is another way."

"No, master!"

"I demand obedience, Five; answer me!"

The robot stirred under the mandatory form, and his voice was reluctant, even while the compulsion built into him forced him to obey. "It is as you have thought. Our minds and even our memories are subject to your orders, just as our bodies are."

"Then I demand obedience again, this time of all of you. You will go outside and lie down on the beach at a safe distance from the ship, in a semblance of sleep, so that you cannot see me go. Then, when I am gone, the race of man will be forgotten, as if it had never been, and you will be free of all memories connected with us, though your other knowledge shall remain. Earth, mankind, and your history and origin will be blanked from your thoughts, and you will be on your own, to start afresh and to build and plan as you choose. That is the final command I have for you. Obey!"

Their eyes turned together in conference, and then Five answered for all, his words sighing out softly. "Yes, master. We obey!"

It was later when Jorgen stood beside them outside the ship, watching them stretch out on the white sands of the beach, there beside the great ocean of this new world. Near them, a small collection of tools and a few other needs were piled. Five looked at him in a long stare, then turned toward the ship, to swing his eyes back again. Silently, he put one metal hand into the man's outstretched one, and turned to lie beside his companions, a temporary oblivion blotting out his thoughts.

Jorgen studied them for long minutes, while the little wind brought the clean scents of the planet to his nose. It would have been pleasant to stay here now, but his presence would have been fatal to the plan. It didn't matter, really; in a few years, death would claim him, and there were no others of his kind to fill those years or mourn his passing when it came. This was a better way. He knew enough of the ship to guide it up and outward, into the black of space against the cold, unfriendly stars, to drift

on forever toward no known destination, an imperishable mausoleum for him and the dead who were waiting inside. At present, he had no personal plans; perhaps he would live out his few years among the books and scientific apparatus on board, or perhaps he would find release in one of the numerous painless ways. Time and his own inclination could decide such things later. Now it was unimportant. There could be no happiness for him, but in the sense of fulfilment there would be some measure of content. The gods were no longer laughing.

He moved a few feet toward the ship and stopped, sweeping his eyes over the river and hills again, and letting his vision play with the city Five had described. No, he could not see it with robots populating it, either; but that, too, was conditioning. On the surface, the city might be different, but the surface importance was only a matter of habit, and the realities lay in the minds of the builders who would create that city. If there was no laughter in the world to come, neither would there be tears or poverty or misery such as had ruled too large a portion of his race.

Standing there, it swam before his eyes, paradoxically filled with human people, but the same city in spirit as the one that would surely rise. He could see the great boats in the harbor, with others operating up the river. The sky suddenly seemed to fill with the quiet drone of helicopters, and beyond, there came the sound of rockets rising toward the eighth and the ninth worlds, while others were building to quest outward in search of new suns with other worlds.

Perhaps they would find Earth, some day in the expanding future. Strangely, he hoped that they might, and that perhaps they could even trace their origin, and find again the

memory of the soft protoplasmic race that had sired them. It would be nice to be remembered, once that memory was no longer a barrier to their accomplishment. But there were many suns, and in the long millennia, the few connecting links that could point out the truth to them beyond question might easily erode and disappear. He could never know.

Then the wind sighed against him, making a little rustling sound, and he looked down to see something flutter softly in the hand of Five. Faint curiosity carried him forward, but he made no effort to remove it from the robot's grasp, now that he saw its nature.

Five, too, had thought of Earth and their connection with it, and had found the answer, without breaking his orders. The paper was a star map, showing a sun with nine planets, one ringed, some with moons, and the third one was circled in black pencil, heavily. They might not know why or what it was when they awoke, but they would seek to learn; and some day, when they found the sun they were searching for, guided by the unmistakable order of its planets, they would return to Earth. With the paper to guide them, it would be long before the last evidence was gone, while they could still read the answer to the problem of their origin.

Jorgen closed the metal hand more closely about the paper, brushed a scrap of dirt from the head of the robot, and then turned resolutely back toward the ship, his steps firm as he entered and closed the lock behind him. In a moment, with a roar of increasing speed, it was lifting from the planet, leaving five little men lying on the sand behind, close to the murmuring of the sea—five little metal men and a dream!



TABOO

By FRITZ LEIBER, Jr.

The sanctuaries were protected against the self-willed warriors—by the self-interest of warriors. Most taboos have a good, even a potent, reason—

"In the name of the Great Heritage, I claim refuge!"

The voice was strong and trumpet-clear, yet with a curious note of mockery. The face was in shadow, but the embers of a smoky sunset outline, with smudged brush-strokes of blood, the giant figure. The left hand lightly gripped the lintel of the low doorway for support. The right hung limp—Seafor noted that there the sunset red merged into real blood, which now began to drip upon the floor.

Seafor looked up. "If I am not mistaken," he said, "you are Arnine, the outlaw—"

"When there was law, or rather, the illusion of law, which there hasn't been, in my lifetime," interjected the other, in an amused rumble.

"—who has ravaged a hundred petty domains," Seafor continued imperturbably, "who has thieved, kidnaped, and killed without mercy, whose trickery and cunning have already become a legend, and who does not care one atom in chaos for the Great Heritage which he now invokes to save his life."

"What difference does that make?" Arnine chuckled. "You have to grant me refuge if I claim it. That's your law." He swayed, gripped the lintel more strongly, and looked behind him. "And if you don't cut your speech of welcome pretty short, it'll be my funeral oration. I'm still fair prey, you know, until I'm inside the door."

There was a sudden humming in the murky sky. A narrow beam laced down, firing the air to incandescence, making a great gout of blinding light where it struck the ground a dozen yards away. Immediately came thunder, a puff of heat, and the smell of burning. Seafor fell back a step, blinking. But in the empty hush that followed the thunder, his reply to Arnine sounded as cool and methodical as his previous remarks.

"You are right, on all counts. Please come

in." He moved a little to one side and inclined his head slightly. "Welcome, Arnine, to Bleaksmound Retreat. We grant you refuge."

The outlaw lurched forward, yet with something of the effect of a swagger. As he passed Seafor, there came from beyond the door a groan of the sort that sets the teeth on edge. Seafor looked at him sharply.

"You have a companion?"

The outlaw shook his head. He turned, so that the ruddy sunset glow highlighted his lean, big-featured face—a dangerous, red-haired god, a hero with a fox somewhere among his ancestors.

"Some beast, perhaps, singed by the blast," he hazarded, and showed his teeth in a long, thin smile.

Seafor made no comment. "Hyousiks! Teneks!" he called. "We have a guest. Attend to his hurts. Relieve him of his weapons." Then he took down from the wall a small transparent globe with a dark cylindrical base and went inside.

It was a ragged and desolate landscape that opened up for Seafor. The crimson band of sky edging the horizon heightened the illusion that a forest fire had recently burned through it. Dead and sickly trees were outlined blackly.

Seafor skirted the blasted patch, holding up the globe, in which a curled wire now glowed brightly. The humming returned. He did not look up, but he moved the luminous globe back and forth to call attention to it.

The groan was repeated. A metallic shimmer caught Seafor's eyes. A few steps brought him to the wreck of a small flier. Beside it, in an unnaturally contorted posture, was sprawled a small figure clad in rich synthetics.

Seafor unlashed the small wrists and did a little to ease the broken ankle. The boy

shuddered and tried to draw away. Then his eyes opened.

"Seafor! Seafor of Bleaksmound!" There was surprise in the shrill voice. He stared and plucked at Seafor's sleeve with his skinny fingers.

The humming increased. It was as if the buzzing of one giant wasp had brought others.

"You're safe now," said Seafor. "Arnine's gone. Your father's men will be here very soon."

The boy's fingers tightened. "Don't let them take me," he whispered suddenly.

"Don't you understand? I said your father's men."

The boy nodded. "Please don't let them take me," he repeated in the same imploring whisper. "I want to stay with you, Seafor. I want to stay at Bleaksmound."

Within seconds of each other, four fliers grounded, their repulsors scattering clods of black soil. From each, two men sprang.

The boy tugged frantically at Seafor's arms, as if by that means he could force a nod or a reassuring smile. Then a kind of boyish cunning brightened his eyes.

"Refuge, Seafor," he whispered. "I claim refuge."

Seafor did not reply and his expression remained impassive, but he hooked to his belt the globe which he had previously set down, and carefully lifted the boy in his arms.

The men hurried up. They wore identical emblems on their blue synthetic coveralls and skull-tight hoods. The carried blasters. They seemed like soldiers, except for a lack of discipline and a kind of animal bleakness that darkened their faces like a tangible film. Because of that film, they did not even seem human—quite.

Seafor's gray robe was crude and beggarly compared with their sleek clothing, but his pale, stern, ascetic face, like something carved from ivory, shone with a light that further darkened theirs.

Now that they faced him, a certain confusion became apparent in their manner.

"We're Ayarten of Rossel's men," one of them explained. "That's his son you've got there. Arnine the outlaw kidnaped him, intending ransom. We brought down his flier."

"I know that," said Seafor.

"We're grateful to you, outsider, for the help you've given Ayarten's son," the other continued. He stepped forward to take the boy, but his manner lacked assurance.

Seafor did not reply. The boy clung to him. He turned and walked toward the dark, square mass of Bleaksmound.

"We must take the boy home to his father," the other protested, following a step. "Give him to us, outsider."

"He has claimed refuge," Seafor told them without turning his head, and walked on.

They conferred together in whispers, but no action came of it. They watched the luminous globe jog gently up the hill, casting a huge fantastic shadow.

"Gives you the shivers," muttered one. "Dead men. That's what they're like. Dead men."

"You can't figure them out. Think of getting light by heating a wire inside a ball of dead air. Like our primitive ancestors. And when there's atom power a-plenty!"

"But they give up atom power, you know, when they give up everything else—when they die to the world."

"Imagine the boy asking for refuge. Scared out of his wits, I suppose. Never catch me doing that."

"I always thought young Ayten was a queer boy."

"Ayarten won't like this when we tell him. He won't like it at all—not with Arnine taking shelter in the same place. He'll be angry."

"Not our fault, though."

"We'd better hurry. Set the cordon. Report to Ayarten."

Burly, blue-tinged shadows, they dispersed to their fliers.

Seafor handed the boy to two of his gray-robed breathren, who had a stretcher ready, and preceded them to the infirmary. He met Arnine coming out of the weapon room under escort, and noted the greedy look on the outlaw's face.

"Remarkable collection you have there," said Arnine. "Some of the fine old models they don't turn out any more. And so many!"

"Some people die in refuge," Seafor explained. "A few become outsiders. And some go away without reclaiming their weapons."

Arnine's ruddy-gold eyebrows arched skeptically. He seemed on the point of launching a satirical reply when he noticed the stretcher.

Seafor motioned the bearers on to the infirmary. "Do you feel up to having dinner in the refectory?" he asked.

The outlaw laughed boisterously, as if the idea of his being too sick to eat was very humorous indeed. His arm was in a sling and the feline springiness had returned to his stride. Seafor accompanied him back along the gloomy corridor.

"Is it your intention to become the accomplice of a kidnaper?" Armine asked in amused tones a moment later. He showed no embarrassment at his previous lie having been uncovered.

"The boy claimed refuge," Seafor said.

"They'd have found him soon enough, and that would have satisfied Ayarten. But the way it is now— Well, you're lucky that the border war with Levenssee of Wols is keeping Ayarten's hands full. Still, even that may not be enough." He shrugged his good shoulder.

An elderly man turned into the corridor some distance ahead of them. He wore a green uniform of archaic cut, faded and frayed but very neat. Disks of a greenish metal formed the chief insignia.

"The president of the Fourth Global Republic," Seafor replied in answer to Armine's immediate question. "Been in refuge here for the past year."

The outlaw expressed incredulity. "Why, if that were the case, he'd have to be two hundred . . . two hundred fifty years old."

"Not at all. When the last elected president died, he exercised his power to appoint an emergency successor to serve until elections could be resumed. Several of his cabinet members held the office. When the last of those died, he handed on the executive authority to some faithful subordinate—perhaps a secretary or bodyguard. It's gone on that ever since."

Armine roared with laughter. "Do you mean to say that that old chap still thinks of the state of the world as merely an emergency temporarily interrupting the majestic and tranquil course of the Fourth Global Republic? Is he grooming a secretary to succeed *him*?"

Seafor shook his head. "He was alone when he came here. He is a very old man. He has decided to sign over his authority to me, when he dies."

Armine's laughter became Gargantuan. "One more worthless tradition for you to guard! One more trinket tossed into the rubbish bag of the Great Heritage!" He looked at the man ahead more closely. "I see a blaster. Isn't that against your rules?"

"As commander in chief of the Earth's armed forces, we have granted him certain

extraordinary privileges," Seafor replied imperturbably.

Armine shrugged his shoulder, indicating that it was impossible to find a laugh big enough to do justice to that jest. They had caught up with the old man now, and Seafor introduced them.

"Your excellency—Armine the outlaw."

The old man inclined his head politely. "It is always good to meet a fellow citizen. Though I warn you, sir, that when peace is restored I will have to proceed against you with the utmost severity." There was a grave twinkle in his eyes. "Still, no need to dwell upon such subjects now. Perhaps you can give me news of what's happening outside this little corner of the Republic. Surely an outlaw ought to get around." His voice became thoughtful. "No one seems to travel any more—perhaps because it's so easy."

Armine seemed to derive amusement from replying in the same quaintly polite veins. Seafor left them talking amiably and returned to the infirmary.

A gray-robed doctor was setting the broken ankle. Unmindful of his sharp command the boy tried to sit up.

"Can I stay here, Seafor?" he called anxiously.

Seafor nodded. "For the present, at least. Now be quiet."

He stood beside the bed until the doctor had finished. Then he looked down at the small damp face and asked, "Why do you want to stay here, Ayten? Why don't you want to go home?" A faint smile touched his thin, pale lips.

The doctor went out.

The boy frowned, trying to find the right answer. A look of fear came into his eyes. "I don't want to go home because . . . because they're not human beings—not father or his women, or any of them. They're—animals."

"All human beings are animals," said Seafor softly.

"When I was little, I thought they were gods," said the boy. "I took it for granted we were all gods. Why shouldn't I? Things that take you up in the sky at the touch of a finger, transformers that synthesize food and clothes and dwelling domes, weapons that annihilate, picture tapes that tell you how to do things—all that and more!"

"But gradually I realized that something must be wrong. All those wonderful things didn't square with our cramped lives, with

the endless jealousies and quarrels and killings. Nobody ever had a new idea. Nobody ever seemed to think. Nobody could answer my *real* questions—neither could the picture tapes. They couldn't tell me why the world seemed to end at the boundaries of Rossel, why we almost never saw strangers, except to kill them, why, with all those wonderful powers, we lived like beasts in a cave!"

His face was flushing with the excitement and relief of talking out his thoughts. Quietly Seafor laid his hand on the small shoulder.

"For a long time I told myself that it must be a kind of test," the boy continued, "that they were seeing if I was worthy of the domain of Rossel, and that some day, when I had proved myself, a door would open and I would walk into the real world, the big friendly world I knew must exist somewhere.

"Now I know there is no door. The real world doesn't exist—except for you outsiders, in some way that I don't understand. And you've given up all the things that we possess." He caught hold of Seafor's wrist. "Why is that? And why, with all our powers, do we live like animals?"

Seafor waited a moment before he spoke. "There was a real world," he said. "There's still a little of it left, and some day it will all come back. Civilization came because men needed each other. They found that life was easier and better if they traded together—not only the necessities of life but also the things that can't be weighed or measured and that haven't a definite bartered value, like the beauty of a song, or the joy of dancing, or the understanding of each other's troubles and hopes.

"As civilization grew, that mutual dependency increased and became infinitely complicated. Each man's life and happiness was the work of millions of his fellow workers.

"But there were forces working in the opposite direction. Man was learning to synthesize materials and make use of universal power sources. Wars accelerated this process, by periodically shutting off supplies of essential raw materials.

"That trend reached its ultimate development with the perfecting of atomic power and the invention of multipurpose transmutators capable of supplying all the necessities of life anywhere.

"At almost any other time that development would have been a great boon, freeing

man's energies for more intensive participation in the social quest. But the shadow of the Second Global Empire still darkened the Fourth Global Republic, and interplanetary war with the Venusian and Martian colonies sapped its strength. The Great Migrations began. There was an endless, seemingly purposeless surging of populations between the three planets, attended by wanton massacres.

"The end product was stagnation. Distrust in the very forces that brought civilization into being. Humanity turned in upon itself, mentally and physically. Small communities came into existence, each built around some leader who had a little more energy and determination left than any of his fellows. The stragglers were killed, or they drifted into such communities—and stayed there. Men were tired. They wanted only to attach themselves to a single locality—to the soil. A vegetative cycle succeeded a cycle of movement.

"In any previous age, hunger and want would have broken that unwholesome equilibrium. But now each little community was independent of trade, so far as the necessities of life were concerned. And as for the things that have no definite barter value—disillusioned men could get along without them.

"The jealousies and rivalries and suspicions of small-community existence came to make up the whole of life. Strangers were persecuted. There was almost continual warfare between neighboring communities, but it remained a petty, spiteful warfare, incapable of giving rise to widespread conquest and the establishment of nations, because it lacked any enduring economic motivation.

"That's the sort of world you've been born into Ayten."

The boy said nothing. Seafor continued, "A few men realized what was being lost. They saw all of Earth's cultural heritage sliding into oblivion, save the bare minimum needed for the new self-maintaining mode of life. Reading and writing, for example, were going into the discard—picture tapes were sufficient to transmit the necessary education.

"These men found that they could not change the small-community system of life from within. So long as they remained part of it, they would have to conform to its savage and inhospitable laws. So they got out of it. They gave up atomic power. They gave up all valued possessions. Only by pay-

ing that price could they purchase even the most shadowy immunity from attack. They formed small communities. They devoted themselves to preserving the cultural heritage and to maintaining the ideals of universal brotherhood and of individual honor and integrity. They became the outsiders."

Ayten whispered. "I want to be an outsider."

Seafor nodded with a frown. "I tell you what," he said finally. "You can live with us as a novice, and work and study for a year. Then, if you're still determined, we'll talk it over again."

Ayten smiled.

In the refectory, Arnine's brown-and-gold tunic made a gaudy break in the long rows of gray, as did the clothing of the other refugees.

Seafor paused by Arnine. "How does it taste after a diet of synthetics?"

The outlaw turned around. "Inferior, of course. But I've been in refuge before. Where do you get such garbage?" he inquired pleasantly.

"Most of it we grow in shallow tanks on the roof."

"Swamp plants, I suppose?"

"No. They originally grew in dirt."

Arnine's long lips curled in mild and somewhat humorous disgust. There came the faint chiming of the bell over Bleaksmound's door. "How's the boy?" he asked suddenly. "Only slightly hurt? As I thought. You'll be sending him back to his father, of course."

"On the contrary. He has decided to become a novice."

Arnine stared at him through half-shut eyes. "You play a strange game," he said finally. "Turning a kidnaping into a conversion! It turns out that *I* am your accomplice! Do you realize the trouble you're brewing? Outsiders exist only on sufferance, you know."

"You mean I should honour your claim of refuge, but not his?" Seafor's eyes were enigmatic.

An outsider approached Seafor from the hall. "Ayarten of Rossel is at the door. He desires to speak to you."

"You see?" said Arnine sardonically. "The way things are going, neither claims of refuge is likely to amount to much. Let me know the terms of his ultimatum."

Seafor went out. Swiftly the refectory emptied as the outsiders went off to their tasks. Two remained, ostensibly to con-

verse with Arnine. The outlaw, prowling restlessly between the empty benches, did not make their task any easier. His ears were cocked all right, but for noises outside the refectory rather than in it. His movements were aimless, seemingly, but when Seafor returned he was standing by the door.

"He gives us until dawn," said Seafor, "to give up the boy."

"And if you refuse?"

"He threatens to make an example of Bleaksmound."

"You see?" said Arnine. "He didn't let his border war with Levensee hold him back."

"I was not counting on that," said Seafor. "Though it strikes me that he is unwise in drawing off so many of his men for the gordon he is setting around Bleaksmound."

"And you will refuse to give up the boy?" Arnine's voice was edged with anger.

"I gave the boy my word that he could stay in refuge," said Seafor. "In the days of the great civilizations, mankind could afford some weaknesses in the individual moral fiber, because the general progressive trends were strong enough to nullify individual treacheries. But now trust in a man's word has become part of the almost forgotten heritage. If we cannot keep that alive, then all the outsiders' work is vain."

Arnine laughed, but unpleasantly.

"Very well," he said. "In that case I shall leave Bleaksmound, for obvious motives of self-preservation."

"Ayarten has set too strong a cordon," said Seafor. "You wouldn't be able to."

"That is for me to judge. Please give orders that my weapons be restored. I leave at once."

Seafor shook his head. "You are our guest. We cannot let you go so soon."

"You mean to hand me over to Ayarten?"

"No. You claimed refuge. You shall have it."

Seafor's sleep turned into a restless, rocking darkness, alive with menace. There was a hand at his shoulder. Someone was shaking him awake. He sat up.

"Ayarten has come?"

"No, but Arnine has escaped. Knocked us down. Darted down a side corridor. Can't be found."

He recognized the voice of Hyousiks, one of the two outsiders he had set to guard the outlaw. He threw on his gray robe and hurried out.

Bleaksmound was alive with movement, like a nest of gray ants in which a spider is loose. Seafor made for the infirmary. It was as he expected. Young Ayten was gone.

From ahead came the hiss of a blaster. Seafor hurried to the entry hall.

Arnine stood with his back to the outer door. In his good hand he held a blaster. The other was out of the sling and fresh blood stained the bandages. At his feet lay young Ayten, unconscious. Arnine's face was racked with pain but he smiled tautly.

Seafor strode toward him. When there was only a few feet between them, Arnine leveled the blaster.

"The first was only a warning," he said. "This time it will be for business."

Seafor stopped.

"I mean to bargain for my life with Ayarten," Arnine continued. "Later you will realize that it was for your good, too."

Behind Seafor the circle of silent gray-robed figures parted to make way for an old man in faded green.

"Who dares do violence in Bleaksmound Retreat?" The voice of the President of the Fourth Global Republic quavered, but a note of iron determination came through. "My authority holds here. Outlaw, put down your weapon." He fumbled with trembling hand for the blaster at his hip.

A ray of blinding light touched the old man, pierced him. Arnine laughed.

In that instant, Seafor lunged forward. The ray shifted, nicked the gray robe, sizzled against the stone floor. Then Arnine was down, grunting with pain because Seafor had thrown him so that he fell on his wounded arm. With both hands Seafor gripped the blaster, wrested it from him, sent it spinning across the floor.

Arnine stopped struggling. "You've wrecked your own last chance of safety," he said.

Seafor knelt on his chest. "And you have murdered. We have law here, although it holds good only within these walls. Our penalty for murder is lifelong imprisonment."

The bell began to clang deafeningly.

Through his weakness and pain, Arnine smiled.

"I think that penalty has been commuted to sudden death—likely for all of us. You know who that is. Dawn has come.

The door opened. It was Ayarten of Rossel, burly, mean-visaged, clad in cloth of gold. But he staggered, his face was chalk-white, the cloth of gold was torn.

He did not see his son lying at his feet.

"Refuge!" he cried. "Levenssee of Wols has struck. He has seized my domain. Those of my men that remained have gone over to him. I claim refuge!"

SENSORY RANGE

THE suggestion that alien races, originating on alien planets, might have totally different ranges of sensory response is familiar in science-fiction; and theoretically possible—even, in certain circumstances, practicable. But in most cases, the answer will be the same on Earth or Deneb IV.

The auditory range, for instance. Man can hear sounds from about 16 to about 10,000 cycles per second when he reaches maturity. A delicately built woman may be able to hear 16,000; a small child can reach even higher. Why, in the ages of evolution, did animal life develop sensitivity to that particular range—for nearly all life-forms use that range?

Above 10,000 cycles, sound waves travel almost in beams, are sharply reflected, and there will be areas close to the source where the sound is inaudible due to out-of-phase reflections, sound shadows, and similar

causes. This effect is so marked that bats use the ultrasonics for range and direction-finding to make safe flying possible in the total blackout of a cave. They produce squeaks up to 50,000 cycles and avoid obstacles that they "see" with their ears. High frequencies are fine for that purpose—but useless for detecting the approach of an enemy, or, at least, too unreliable. He would be able to approach not only unseen, but unheard, by simply keeping a boulder between you and himself. Low-frequency sound reaches around obstacles; the animals that survived had that protection.

Those same engineering principles apply anywhere, in any atmosphere, with only slight change with changes of speed of sound. The inhabitants of alien planets may not be able to speak our language, but they'll hear it, and we'll hear theirs.

THE ANARCH

By **MALCOLM JAMESON**

The ideal of totalitarianism is the elimination of all individual initiative. Suppose that ideal were somehow attained. With no one, anywhere, wanting to revolt—

It was a death paper.

Medical inspector Garrison shifted uneasily in his chair and stared at it. It was all wrong. It was on pale-green paper for one thing, and it had been altered. Down near the bottom where there was a place for a date and a signature, the word "Discharged" had been xxx'd out and "Died" supplied.

"Look here, Arna," he said to his scribe, "this won't do. This . . . er . . . ah . . . Leona McWhisney was admitted only last week . . . neomalitis, the diagnosis says . . . treated with sulfazeopronyl, and due for discharge tomorrow. Treater Shubrick has scratched out the discharged and put in 'died.' That's absurd. People just don't die of neomal."

"She did," replied Arna primly. "Here's the morguemaster's receipt."

Garrison took it and frowned. Not only did she give him the morgue slip, but the report of the autopsy as well. The McWhisney woman's dead arteries had been found to be crawling with neomal bugs—and nothing else. It was a hard fact to face, and he did not want to face it. He couldn't face it. It was Earth-shaking, outrageous, impossible. It could not be reconciled with anything he knew. It put him in an awful hole.

"But look," he insisted, "we can't use the green form. That's the one for case histories of nonfatal diseases, and the Code classifies—"

"I know," she snapped, "Neomalitis is a Category N malady, a mild, easily controlled undulant fever. I looked it up. Article 849 of the Code says Category N must be reported on the green form. That is what I have done."

"That is not right," he growled, glaring at the offending sheet of paper. "If the woman died, it has to be reported on an authorized death certificate. Anyhow, we are not allowed to change any form. Not

ever. It means a lot of demerits for both of us."

She sniffed. She knew that as well as he. She had been struggling with the problem for two hours, and her desk was littered with volumes of the bulky Medical Instructions—those bits of the Grand Code by which they lived and which prescribed their every act.

"All right," she said coldly. "You select the right form and I'll fill it out."

Medical Inspector Garrison started to make an appropriate reply, then thought better of it. He was in no ordinary dilemma, and was beginning to know it. It was more a being caught between two opposing sets of antlers bristling with scores of prickly points. The death, as far as that went, of the obscure Leona McWhisney meant nothing to a seasoned doctor. People were dying at Sanitar all the time. But they were dying in approved ways that could be reported on approved forms. Her departure from the normal played hob with the whole Autarchian set-up. Garrison groaned aloud, for he was, until that moment, a thoroughly indoctrinated, obedient, unthinking cog in the vast bureaucracy that was Autarchia. Not once in the thirty years of his life until then had the Code failed him. He had never doubted for an instant that that wonderful document was the omniscient, infallible, unquestionable guide to human behavior. It was unthinkable that he could doubt it now. And yet—

Yet Leona McWhisney was dead, and it was his duty to sign the death papers. By doing it he would certify that her case had been handled in accordance with the Code. There lay the rub: It had been, he was sure, for he knew the superb organization of Sanitar and especially the wards under his control, and it could not have been otherwise. There was no one who would have dreamed of departing from the sacred instructions by an iota. The problem lay,

therefore, on his own desk—how to close the case and still keep out of the Monitorial Courts.

The dead woman's disease, as was every other, was curable, and must be recorded on the green. So decreed the Code. But she had died inexplicably despite the Code, and having died, she must be given a death certificate. But there were only three forms of those, for there were only three possible ways for an Autarchian to die. The most common—reportable on the gray form—was by euthanasia after recommendation of a board of gerocomists, and approved by the Bureau of Population Control. Elderly citizens beyond further salvage, or those in excess of the Master Plan were disposed of in this fashion. Then there was the yellow form that was employed when violent accidents occurred. Even the all-wise framers of the Code had not known how to recapitate or re-embowel a citizen thus torn apart. Last of all there was provided the scarlet form for the use of the executioner at Penal House after the monitors had finished dealing with dissenters. That one was on the road to obsolescence, for in recent generations there had been few who refused to abide by the Code, or scoffed at it. The trait of rebelliousness had been pretty well bred out of the race.

Still there must have been some taint of it left, for even Garrison could not bring himself to accept meekly his predicament. If people could die of neomalitis, he thought, the Code should have foreseen it and provided for its proper reporting. Apparently they could, and apparently it had not. There was something smelly somewhere.

"When you make up your mind about that," broke in Arna, sweetly, "here are a couple of other questions they want rulings on. The treater on Ward 44-B says that he has twelve patients with neomal that should have been up and out today. The prognosis says so. He wants to know if he keeps on shooting sulfazepropnyl. He has given all the therapeuticon prescribed."

"No, of course not. Better run 'em through the Diagnostat again and take a fresh start."

He watched unhappily as she made a note of it. It was an unsatisfactory answer and he knew it. There was no more authority for rediagnosing a case than for prolonging treatments after it was supposed to be cured. But it seemed to him that as long as they continued to be sick something should be done.

"And the admission desk wants to know," she went on, "what about quotas? According to vital statistics Sanitar is supposed to get only three hundred cases of neomal a quarter. We've admitted that many in the last ten days. Shall they keep on taking 'em in, or turn 'em away?"

"Oh, we can't turn 'em away," said Garrison weakly. He was right, too. The Code specifically forbade it. But the Code had also set the admission rate for Sanitar, based on the known incidence of various diseases, and it could not be much exceeded for the excellent reason that the hospital's capacity and personnel were fixed by the Master Plan.

"Yes, sir," said the exasperating scribe, and jotted down his answer.

He glanced worriedly at the McWhisney papers on his desk. He could not sign them as they were. He had to make sure.

"I'm going to make an inspection," he announced, and stalked out of the room.

Medical Inspector Garrison was what the Autarchian Code had made him. It was no fault of his that he had been born into a perfect, well-ordered world where every detail was planned and there was no room for independent thought or initiative. He was the natural result of his training. His very first memories had to do with the Code, and from then on he had never encountered anything else. At the age of five the Psychometrists had come and taken him from his creche and tested him with glittering instruments that gave off dazzling multi-colored lights. That was when his first psychogram was made and his Cerebral Index established. That was what set him on the road to doctorhood, and made him an interne in a Sanitar at the age of fifteen. By that time he had mastered the Junior Social Code and most of the Medical, and along with it he learned those portions of the Penal Code that applied, plus such other fragments as would be of use. No man alive, with the possible exception of the Autarch himself, could know the whole of the Grand Code, for it covered the entire field of human knowledge. Garrison only knew that whatever there was to be done, the manner of doing it was to be found in some part of the Code. And he also knew that there was no *other* way of doing it. That is, unless he wanted to invite the attentions of the monitors. And it was common knowledge that no one who went to Penal House was

ever seen again. The Autarchs did not encourage nonconformity.

It was with this background and the puzzling conflicts of the morning uppermost in his mind that he strode along Sanitar's endless corridors. Hitherto the Code had never failed him. Now he was lost in a maze of contradictory instructions, not one of which he dared question or refuse to abide by. Heretical ideas kept flitting through his troubled brain. Long dormant traits began to stir and come to life within him. Curiosity was one. Somehow it had survived in his heritage of genes. He wanted to know—wanted desperately to know—*why* Leona McWhisney had died, when the book said she couldn't? What was happening in neomalitis? Why was it fast becoming more prevalent? What was making it more virulent? Why didn't the sulfa drug still cure it as it had always done before?

He arrived at the admission desk and and looked about him. Everything was exactly as it should be. There the applicants were being logged and turned over to the attendants to be stripped and scrubbed prior to their full examination. Their dossiers were being sent for.

He picked up one at random and examined it. It was a magnificent document, many inches thick. In it was the record of its owner's medical history from birth, complete with the X rays and body chemistry findings taken at every successive annual examination. There were curves of growth and change, and accounts of incidental illnesses. Everything the most exacting doctor could want was there.

Garrison laid it aside and went on. He passed by the various examining rooms and laboratories with little more than a glance in. All were carrying out their functions perfectly. In one place blood and spinal fluid were being analyzed; in another, men sat in rows having their electrocardiograms recorded. A group of psychomeds were probing neural currents to find out a patient's attitude toward his own condition, and elsewhere the newcomers lay on cots having their current basal metabolism established. In the biological lab observers were scrutinizing bacteria cultures and dissecting tissue. Everywhere there were checkers, going over the other fellow's work.

The young inspector knew there could be no slip-up in the collection of basic data. A quick turn through a couple of wards revealed things going well there also, so far as the medication was concerned. He even con-

sulted with the chief pharmaceutical inspector to make sure the drugs used were up to standard. Perfection reigned in exact accordance with the Code. The only jarring note was that the wards were becoming crowded. There were ever more sick, and the sick ones were not recovering as they should. In 45-B Garrison was stunned to learn that two more neomals had just died, and that several others were about to. It took the McWhisney affair out of the freak class. It denoted a trend. It also ended the hope of overlooking that first case.

There could be but one other factor. The data were correct, and the treatment given as prescribed. The only other room for error was in the diagnosis, so Garrison went to the elevator bank in the great central tower. No one had ever questioned a Diagnostat before, but he meant to now. He punched the button for the express car to the sub-basement.

The only word to apply to the cavern where the ponderous machines purred and ticked was—vast. The great monsters stood in long rows—the Sorensens down one side of the room, and the Klingmasters the other. Those massive calculators were the only examples in all Autarchia where two distinct models of machines were doing the work of one. In every other case the framers of the Code had selected the best type and discarded all the others. But the Sorenson and Klingmaster Diagnostats arrived at their findings through radically different channels. Since they were equally efficient both were kept, to be used in opposing pairs, one to check the other.

Garrison offered the foreman of the room the dossier of Leona McWhisney.

"Hm-m-m," mused the foreman, glancing at the record. "This has already been through—done on Sorenson 39, cross-checked by Kling 55. Neomalitis, Type III, sub-type C. What's wrong?"

"She's dead," said Garrison.

The foreman shrugged.

"All we do here is diagnose 'em. If they kick the bucket, it's somebody else's fault. You'd better check up on your treaters, or on the dope they use."

"I have. It must be the diagnosis. It can't be anything else."

"Oh, can't it?" countered the Diagnostat foreman. "Did you know they lost ten pneumonia cases over in Bronchial wing last week? Did you hear about the guy up in Psychopathic? A mild neurosis was all we

had on the fellow here. Well, he ran amok last night—cut the throats of four fellow patients and then jumped out the window. There is something screwy going on, all right, but it's not down here."

"I want a recheck on this," insisted Garrison.

"But she's dead," objected the foreman. Then he saw the glitter in Garrison's eye. "O.K.," he mumbled, and reached for the book.

Garrison looked on in silence while the monster did its work. The data was fed in by various means through various orifices. Queerly punched cards bore part of the information—such items as could be expressed by figures, as weight, pulse, blood pressure, respiration, and, so on. The curves of the cardio and encephalograms were grabbed by tiny steel fingers and drawn into the maw of the machine. It clucked loudly as the X-ray plates were slid into a slot. The amplitude and frequency of the undulant fever readings were given it. When all was in, the foreman closed one switch and opened another.

"This is a different Sorenson, and hooked up with a different Kling," he said. "Both were overhauled last night, but I'll bet you get the same answer as you got before."

"That's what I want to know," said the inspector.

The machine purred and groaned. Then it set up a clicking and stopped momentarily. Up to that point it had ignored the symptoms, Garrison knew, and was engaged in breaking down and analyzing the basic factors. Now it reintegrated them and was ready for its first pronouncement. A window lit up with glowing letters:

Constitution fair. Physical Resistance Factor: 88.803; Psychic Factor: 61.005. Composite Factor: 72.666.

The light died, and a confirmatory card dropped out. The purring was resumed. Garrison considered the figures. They were about right. The woman had been of excellent general physique, though a trifle depressed in spirits. She should have thrown off any disease with reasonable ease.

Now a red light was burning, indicating the Diagnostat was taking into account the developments due to infection. After a bit a gong sounded, and the machine growled to a full stop. Another card dropped out:

Neomalitis, Type III, sub-type C.

Garrison looked at it, then walked across

the hall to the Klingmaster. It was slower to reach its conclusion, but when it did it was identical.

"All right," said the foreman, "that's that. Now let's do the rest."

He poked one of the cards into a smaller machine—a therapeuticon, with prognosticon attachment. It took the contraption less than a minute to cough out the answer:

Indication: 6 g. sulfazeopronyl every four hours for eight days. Tepid baths daily; abundant rest.

Prognosis: Discharge in nine days, ten hours.

Garrison looked crestfallen. He thought he had an out. Now he was where he started. He shook his head dismally.

"She's dead," he said, "and it's only a week."

"An autopsy ought to settle it for you," suggested the foreman.

"It has," said the miserable inspector. "It said neomalitis."

And he walked away, leaving an indignant Diagnostat man glaring after him.

Garrison signed the pale-green paper reluctantly. There seemed to be nothing else to do. Then he glanced at the chronodial and saw that it was nearly seventeen, time for the day-watch to go off duty. At that moment there was a shrill warning buzz and the omnivox lit up. A fanfare of trumpets warned that something big and unusual was about to come through. He got to his feet and stood at attention. A uniformed figure appeared on the screen.

"By order of his supremacy, the Autarch," he proclaimed in a deep, sonorous voice. "Effective immediately, those provisions of the Social and Penal Code requiring attendance during Renovation Hour at Social Halls is suspended for officials of C.I. one-thirty or better. Such officers may attend or not, as they choose—"

Garrison blinked. He had never heard the word "choose" before and had but the faintest idea of what it might mean. More obscure ones were to follow.

"If they so elect, they may stay within their own quarters or visit other officers of similar rank in theirs. Restrictions as to topics of conversation are lifted during this period. Officers will not be required to discuss assigned cultural subjects, but may talk freely on any topic they prefer. Monitors will make note of this alteration in the Codes.

"The order has been published. Carry on."

The light failed, and with it the figure on the screen. Garrison continued to stand for about a minute, entirely at sea as to what the communication he had just heard meant. Such words as "elect," "choose," and "prefer" had long since become obsolete if not actually forbidden. The concept of choice was wholly absent under the autocracy. It never occurred to one that there could be such a thing—it was inconsistent with orderly life. One simply obeyed the Code, which always said "you shall." To think of anything different was rank heresy and treason, and subject to the severest penalties. Garrison puzzled over the order a moment and gave it up. No doubt there would be further clarification later. Perhaps the Propag lecturer of the evening would have a word to say about it. The order would be carried out of course, but to Garrison's well-disciplined mind it had the bad fault of ambiguity.

The ringing of the corridor gongs snapped his attention away from it. It was time to assemble for supper. He closed his desk, slipped on his tunic, and stepped out into the hall. There he faced to the left as the others were doing, and waited for the whistles of the monitors.

The signal was sounded, and the tramp of feet began. Garrison stepped along as he always had done, but with the difference that on this afternoon there was turmoil in his mind. Having to sign that altered document had done something to him. It hurt, and hurt deep. It is difficult for anyone not imbued with bureaucratic tradition to comprehend the poignancy of his anguish. He had been forced by the rules themselves to break a rule. For the first time in his existence he was compelled to question the all-wisdom of the Code. The Code had declared neomal curable; he had seen the exception. And while he was still quivering with mortification at that discovery, the pronouncement of the Autarch had come. He did not know what it meant precisely, but it signified one more thing clearly. The Autarch had seen fit to *modify* a Code. The implication was inescapable. The Codes were not infallible. If one provision could be altered, so could all the rest. It was food for anxious thought.

The marching men came to a downward ramp and took it. On the level below Garrison had to mark time while the officers of that floor cleared the ramp below. He took the occasion to look them over critically—something he had never thought of doing

before. Like himself not a few of them but also had had inexplicable deaths in their jurisdictions, and every one of them had heard the message just received from the Autarch. But not one of them showed the flush of suppressed excitement that he was awkwardly aware warmed his own cheeks. If there was any who shared his newborn doubts, none exhibited it.

They marched like so many automatons. Nowhere was there a sign of perplexity or frustration. Instead, he now observed that all were sunk in the same dull apathy that he had noticed in the incoming patients. It was not the apathy of weariness or despair, but a sodden, negative something—sheer indifference. They did not care. There was no motive to care. Their personalities were not involved, if a citizen of Autarchia could be said to have such a thing as a personality. They were required to put in so much time, and to obey certain inflexible rules. So long as they did that they had no responsibility as to the outcome. Now they had done their stint and were on their way to replenish the energies they had expended by the ingestion of necessary food. The evening to follow would be but an extension of the day—planned, orderly, meaningless.

At times the worm turns in a curious way. In that split second the spirit of some long dead ancestor stirred within Garrison and woke him up. The breath taking realization came to him that he was an *individual*—he, Philip Garrison, Medical Inspector of the B wards of Sanitar. He was different somehow from those others. They were clods, puppets. What did it matter what their Cerebral Indexes were, so long as they could read and punch the proper buttons? Anyone above the moronic level could do the same. No thought or judgment was demanded to conform to the Code. Small wonder they swung along like men stupefied.

Garrison could not avoid a slight shudder. The trend of his thoughts were highly treasonable. Then he reminded himself that the monitors possessed only hidden mikes and scanners; they were not telepathic. They could not read the heretical notions striving to make themselves dominant in his brain. He calmed himself, and tried to change his line of thought, for he knew that madness lay that way. He endeavored to recall what a Propag had said at a recent lecture about the "dangers inherent in independent thought" and the hideous predic-

tions of how disruptive such ungoverned activity could be.

The arrival at the dining hall put a temporary end to that. He handed his ration card to the Dietitian of the Watch. She glanced at it, scribbled the prescription, and dropped it into the messenger tube. That was all that was required. He marched on with the living robots about him. Shortly he would get food that would no doubt be good for him—sustaining, and containing what he needed, neither more nor less. It would have the calories required, and the vitamins, and the minerals. It might be tasteless, it might be unpalatable, it was almost sure to be mostly synthetic. But it was what his metabolometer called for, and with that there was no arguing.

Garrison ate in sullen silence. So did the others, but with a difference. Theirs was the stolid silence of oxen at a trough. Even the direction and the ranking members of his staff on their raised dais ate in the same manner. It was a thing they had to do—it was part of the routine, joyless but necessary. Now Garrison was beginning to understand why people were falling ill with such ease, and being ill, failed to rally. Life was empty. They did not care, nor did their physicians care. It was that spirit of don't-give-a-care that was pushing Autarchia to the brink of ruin.

"I'm going to do something about this," muttered Garrison to himself, "and I'll start by finding out why neomal kills."

He went out with the crowd when the "dismiss" signal was given. He took the elevator to the tower where the gyrocar was waiting. Then he sat in the seat his position rated—one by a window, and hung on as the car teetered drunkenly as it cleared the slip. After that it straightened up and went whizzing along its elevated monorail, careening around curves on its nightly trip to Dorm.

The sun was on the point of setting, but everywhere there was full light. It was rolling country, covered with fields, and the horizon was broken only by the occasional bulk of a plant where alcohol or plastics were made from the products of the soil. The intervening fields were planted in corn and tomatoes, bulk crops that could be grown more profitably outdoors than in the hydropones. An army of low C.I. laborers was still at work, spraying the lush weeds under the watchful supervision of the agro-

nomists who sat perched on lofty chairs set up among the tasseled rows.

Now that Garrison's eyes were opened, he saw what he had looked at daily but had never comprehended before. It was that the laborers' work was futile. The cornfields and the acres of tomatoes were like his wards in Sanitar. Uncontrollable and malignant weeds and blights had moved in and were taking them. As the car rushed over a hilltop where the ground rose up almost to it, he could see the details better. Where once the fruit hung bright and red and round, it was now sparse, discolored and misshapen. Plump ears of corn were replaced by scrawny spindles riddled with wormholes. Garrison could glimpse them now and then despite the weeds which in many places towered even above the tall corn.

The sight added to his glumness. It had not always been that way. Only a few years before the fields had been clean and sparkling—good reddish soil topped with orderly rows of the desired crop plants and nothing else. Insecticide sprays and selected chemical soil treatment used to work. Lately they did not seem to. Why? They had successfully done so for two hundred years. What was bringing about the change? Was the Agricultural Code inadequate, too?

The car swerved and swept across the highway. A pile of grim gray buildings flashed by. That was one of the many structures known as Penal Houses. To Garrison's new awareness it took on a change of significance. It was another symptom of what was wrong with Autarchia. Designed to hold ten thousand unhappy rebels awaiting execution, today it stood empty. Seven generations of systematic extermination of dissenters had done its work. The breed was now extinct. No one thought of, let alone dared, dissent these days. The very concept of nonconformity was extinct. Garrison knew of it only because of the warnings of the Propags and the presence of the watchful monitors. Yet the prisons still stood. They were useless anachronisms now, complete with large garrisons of monitors waiting boredly for more grist for their mills. But they could not be abolished because they, too, were part of the Master Plan. What was must always be.

Garrison turned away from the prison in disgust. It would be better, he thought, if the idle monitors were put to work in the fields tearing out the weeds by hand. Then they would be at something productive.

The car swirled on. Suddenly, but briefly, the panorama underwent a change. For about a mile there stretched a field that was uncontaminated like the rest. It looked as all of them used to look. Then the car left it and was over another planted with the same crop, but as weed-choked as the earlier ones. The contrast of the one well-kept field with the others was startling.

Garrison craned his neck to look back. As he did he became aware that the officer sitting behind him was watching the act intently. He was an old man and wore the distinguishing marks of a high ranking psychomed. It was that that made Garrison uneasy, for many of the senior psychomedes seemed to possess the uncanny knack of reading people's minds. In the state of agitation he was in he preferred not to be under one's scrutiny.

"Rather different, eh?" queried the older man, with a quizzical smile. "Why, I wonder?"

"Different soil, probably," ventured Garrison, feeling some answer was expected.

"Hardly," remarked the psychiatrist. "They took such differences into account when they drew up the Master Plan. All these fields are assigned to the same tillage."

"I'm only a medic," hedged Garrison, "I wouldn't know."

"For the very reason that we are medics," pursued the other, "it might pay us to know. Below us are fields that have been successfully farmed for centuries. Now the pests refuse to be kept at bay. They are conquering except in that one field that seems to interest you. It would indicate, I think, that one Agronomist knows something the others do not. That fact is worthy of our consideration."

"Why?" asked Garrison stupidly. He knew it was stupid, but the conversation was taking a perilous turn. This psychomed was probing dangerously near to his heretical inner thoughts. Garrison wanted to mask them.

"The analogy between vegetable blight and human disease ought to be apparent to anyone," shrugged the elder doctor. "We study both and find remedies. Then, in the course of time, one or the other or both get out of control. Haven't you found it so?"

"A woman died in one of my wards last night," hesitated Garrison, "if that is what you mean. She should not have, so far as I can see. But we did our duty under the Code—"

The psychomed glanced cautiously about. The other passengers dozed sluggishly in their seats. The noise of the car precluded eavesdropping.

"Our duty is to save lives, my friend," he said in a low tone. "In that the truly excellent Code is our best guide. But there is coming a time, and soon, when it must be changed—"

"Yes, yes, perhaps," said Garrison, flurried, half frozen with alarm. Those were fearful words, and a lifetime of listening to Propags had set his reflexes. It was not a light matter to change their patterns. "If such a time should come, no doubt the Autarch will give consideration to it."

"The Autarch is neither doctor nor agronomist nor any one of the hundreds of other kinds of specialists it takes to operate a world like ours. He may sense impending peril, but how will he know how—"

"Sir," said Garrison stiffly, scared through and through, "your words border on treason. I refuse to listen. Have a care, or you will find yourself in trouble."

The old man gave a contemptuous snort.

"Trouble? Listen, boy. I am inspector general for all the Sanitars in this hemisphere. You know of several unaccountable deaths; I know of thousands. You have seen a handful of stricken fields; I have seen abandoned wastes stretching hundreds of miles. It adds up to one dire result—pestilence and famine. Not yet, but soon. If you think the monitors are to be feared, think on that pair of scourges."

Garrison kept silent. He was afraid still in spite of himself, but he wanted to hear more.

"As for myself, nothing matters," continued the psychomed. "I chose to speak to you because you turned back for a second look at the one well managed field. It showed me that regimentation had not made a clod of you altogether. There are not many of us like that, so I broke the ice. Tomorrow I appear before a Disposal Board. The gerocomists say my heart is beyond aiding and my course is run." He grinned. "And having a bad heart I am immune from torture. Euthanasia or standard execution—it's all one to me."

"I'm sorry, sir," said Garrison.

The gyrocar was slowing for the approach to Dorm.

"You needn't be," growled the old doctor, taking in the other occupants of the car in an all-inclusive sweep of the arm.

"Be sorry for *those* dumb inert creatures. And by the way, if you care to pursue the subject further, the name of the agronomist in charge of the field you liked is *Clevering*."

The car reeled to a stop. Garrison scrambled to his feet and crossed the spidery bridge that gave access to the high tower of Dorm. Beneath were the huge public rooms, the baths and gymnasiums and the libraries of the Code. Down there were kept the individuals' records, and also where the vast social hall was. The rooms and dormitories were in the starlike wings.

Garrison took the elevator to his floor, and walked along the corridor of his section. The door of the cubicle he called home was open, as all doors had to be when the room occupant was absent. He went in and lay down on the narrow bunk for the prescribed period of rest. From it he surveyed his habitation with some curiosity, never having thought to do so before.

There were the plain plastic walls, dimly luminous, and the Spartan cot he lay on. There was a chair on which he hung his clothes at night. During the night an attendant would come and replace them with others. He had no need for any but the authorized costume of the day, and it was always provided. There was a small wash-bowl with a shelf and mirror above it, beside which was posted his individual hygiene instructions—the hours of rising and going to bed, the hour and nature of the bath he was to take, and such details. On a small table lay a copy of the Social Code. That completed the furnishings.

Ordinary Garrison spent the rest period relaxed and with a blank mind. Today he could not. He kept turning over in his mind the problems that seemed to be growing more complex hourly. There was the death of Leona McWhisney, the enigmatic edict of the Autarch, the provocative remarks of the psychiatric inspector, and the mystery of the one uncontaminated farm. Now he had to decide also what he was going to do about the Social Hour. The daily event was always boring, as was most of the well-ordered life he led, but it was a way to while away the time until the hour set for sleeping. He wondered how one went about visiting another in his room, and if he did visit what they would talk about. And that caused him to open an eye and wonder where was the scanner-mike that kept watch on his room, and whether it was alive all the time, or only now and then.

Habit is strong. He was already sitting up on the edge of the bunk when the standby buzzers sounded. That meant five minutes until Social Hour began. He was already tired of his cell and wanting to move. He heard doors outside being opened and the shuffle of feet. The others were on their way. He hesitated, then got up and went out, too. There was not a closed door in the hall. The man opposite him had just come out—a master electrician, in charge of the X-ray machines.

"You are going as usual?" asked Garrison.

"Where else is there to go?" answered the fellow.

"We could stay here and talk," suggested Garrison.

"About what?" he asked curtly, and turned down the hall.

The harried glance he gave the walls and ceilings as he did was the clue to his behavior. Garrison instantly read it aright. The Autarch's edict of the afternoon stated that certain regulations were "suspended." There was nothing in the way of assurance that the free conversations allowed would not be listened to and recorded by the monitors. Garrison frowned. Could the Autarch's seeming generosity be a ruse to entrap the unwary? Small wonder the fellow had ducked. For his part Garrison realized he had just had a narrow escape. He meant fully to discuss the McWhisney death and other things with anyone who would listen.

Garrison went on to the Social Hall. The evening proved to be, if possible, duller than usual. Garrison found the other officials ranged in chairs before the lecture platform waiting stolidly for the Propag to begin. None had so much as delayed his coming. Garrison sat down at his customary place. The Propag was coming on the stage.

"It has come to my ears," he began in the sing-song voice affected by the members of his profession, "that a few of you are troubled. In hours of weakness it is human to falter, and there may be some so debased as even to doubt our wonderful Code in the dark moments. That is evil. The Code is all-wise. Believe in it, follow it, and trouble not. All will be well. Let us, my friends, go back and remember our first lessons.

"In the beginning there was chaos. All the world was divided into many nations, speaking different languages, having differ-

ent customs, and struggling one with another—"

Garrison did not have to listen. The famous "Basic Lecture" had been dinned into his ears at yearly intervals all his life. Once it meant something, now it was an empty piece of ritual. Men sat through it unhearing, for they knew its words by heart.

It told of the Bloody Century—the Twentieth—and of its devastating wars. Those were the bitter conflicts between Imperialists and Republicans, Totalitarianism and Democracy, and the varicolored races. Then would come the story of the infant leagues and unions of nations, and the bickerings among them for top power. Afterwards there were fierce revolts in certain quarters. The world before The Beginning was a world of strife and murder and destruction. It was a horrid world.

"Yes, horrid!" the Propag would scream at that point. "An insane world. A world where there were many opinions about the simplest matters. Men differed, and because they differed they fought. It was under the sage Harlking the Great—the Autarch of the Fourth Coalition—that the Grand Code came into being. He perceived clearly that the world, though not perfect, was good enough if men were only content. So he convoked an assembly of the thousand wisest men of the age. These were the men we now call the framers, for their task was to sift the world's store of wisdom and select the best for inclusion in the Code. It took forty years for them to complete their colossal work, but when it was done the Autarch pronounced it good. That was Gemmerer the Wise, for Harlking did not live to see his glorious idea come to fruition.

"Gemmerer promulgated the Grand Code, and in doing so forbade that it ever be altered. He foresaw that there would still be impatient men, or dreamers who might try vainly to better things. Man in primitive societies is hopelessly inventive. He is never content with things as they are. This was an admirable trait in the formative days of civilization, but in a highly integrated world community it harbors the germ of warfare. The introduction of a new thing is always a challenge to the old, and the partisans of the old invariably fight back. There must be no more war. Therefore there must be no new thing. Stand men, and repeat the creed of our fathers!"

Sheeplike the audience stood. The Propag led off, and the mumbled chorus of responses followed.

"The Code given us is good!"

"It must not be altered."

"It is the quintessence of the wisdom of the race!"

"It must not be questioned."

"It must be obeyed forevermore."

"Amen."

The rumbling echoes of the whispered responses died, and the men dropped back into their seats. The Propag treated them with his professional glare for one solemn moment. Then he partially dropped the cloak of solemnity.

"Is there anyone present," he asked, still stern, "who . . . ah, *prefers* to talk about a topic other than the one we have been studying?"

Several men shifted uneasily in their seats, but no one answered.

"Very well," said the Propag, "we will break up into the usual groups. Group directors please take charge."

There was a rustling as the men found their way to the places where they were to be treated to cultural enlightenment. Garrison joined his proper group dejectedly. He cared less than ever for the plump, curly-haired young man who was his renovation director. That worthy looked his small flock over and saw that they were all present.

"Last night," he chirruped with a false heartiness that made Garrison want to smack him, "we were discussing the complementary effect of strong colors when placed in juxtaposition. Now, if we take a vivid orange, say, and put it alongside an intense green—"

Garrison heard it out, bored stiff. Real problems were stewing inside his head, and the froth he was compelled to listen to angered him. Otherwise it was simply dreary. But eventually it came to an end, and the Social Hour broke up. Garrison caught up with a departing agronomist, and asked him where he could find Clevering.

"Clevering? I think he's sick. He collapsed in the field today. As I was coming in I saw a Sanitar ambulance going in the gate."

"Thanks," said Garrison, and tramped down to his cubicle, and to bed.

Nine more neomals died in Ward 44-B that night, and in the morning there were no discharges. But waiting at the admission doors were hundreds of new cases—too many to be accommodated under the quota. Garrison noted with a wry sort of satisfaction that the admitting doctors were also struggling with an insoluble problem. There

were others besides, as he found out when he reached his office. Treater Henderson was awaiting him there with a sheaf of new diagnoses.

"What am I supposed to do with these?" he asked, plaintively, shoving them into Garrison's hands. Garrison took the topmost card and stared at it.

Diagnosis: Neomalitis, Type \$#!.. etaoin-shrdlu . . sputsputput.

Treatment: Sulfazeopropopropopropopop . . . nyl!

Prognosis: ????????

He scowled and grabbed up an intercommunicator. In a moment he had the foreman of the Diagnostat room on the wire.

"Have your machines gone crazy?" he snapped. "They stutter. They give us gibberish."

"Can't help it," came back the answering voice. "We tried machine after machine. They all do it. And our tests conclusively show—"

Garrison flipped off the connection. He was up a blind alley there and knew it. He turned to the treater.

"Keep on giving 'em the standard sulfa treatment."

After the treater left Garrison sat down weakly and wiped the sweat from his brow. So far he was within the Code, for sulfa drugs were indicated for all cases of neomal regardless of type. But intuition told him that hereafter it would do no good. The stark truth was that the neomal bug had bred itself into a new type—a strain far harder than the old, and more malignant. What he had to contend with was a bacillus that was practically immune to sulfazeopropoponyl. It was, therefore, causing an utterly new disease, one not contemplated by the august framers. And, unless something was done quickly, a decimating plague would shortly be sweeping the world.

But what? The Code prescribed only the sulfa drug in such and such quantities, and the penalties incurred for administering any other were cruel. Garrison stared miserably at the stack of diagnosis slips. For once he felt a sense of personal responsibility to those sufferers down in the wards. He felt like a murderer. Then his eye lit on a name atop a card. The name was, "Henry Clevering, Agronomist 1st Class."

He lost no time in getting down to the ward.

The wards of Sanitar were not wards in

the old sense, but groupings of rooms, and Garrison found his man in the fourth one on the left. The moment he saw him he knew his hours were numbered, for the chart showed the oscillations of the fever hitting ever new highs with a shortening of the period between. Already the ever vigilant monitors had set up a portable mike beside the bed to record his ravings when a little later he would be in delirium. In earlier days such deathbed revelations had often given them valuable leads to subversive dissenters still living.

Garrison saw the fever eyes of the sick man following him about the room, but he went about what he had to do. He closed the door softly, and then stuck a wisp of cotton into the mike so as to damp its diaphragm for the time being. He sat down beside the patient and placed a cool hand on his forehead.

"The weeds have got me at last, I guess," said Clevering, smiling feebly, "weeds or blight. They're getting bad, you know."

"Yes, I know," said Garrison, "and that is why it is bad for Autarchia to lose a man who knows how to fight them."

"Autarchia?" whispered the other, "a lot Autarchia cares. If they knew what I know, they would have crucified me long ago. But you are not speaking for Autarchia, or you would not have shut off that spy's ear."

"By Autarchia I meant the human race," replied Garrison, soothingly. "I saw your farm last night. I really saw it, for I've been blind up to now. I want you to tell me how you kept your field clean. We have needs of a sort here too, you know."

Clevering smiled wanly.

"You want to know what I did, eh? Well, I forgot the Code when I saw it wasn't working any more. I tried this and that until I found something that did work. Organic things don't stay put. They grow and change and evolve. What stood off the blights when the Code was drawn isn't worth anything these days. I found that out years ago when it first got bad. I falsified my records so the inspectors wouldn't know. That is how I kept out of Penal House. Maybe I should have spoken out before, but who was there to hear? I do love a clean cornfield, though, and that's why I kept plugging. The books helped, too."

A spasm of shivering shook him as a fresh chill came on. Garrison gave a worried look at the chart. He had not arrived too soon. The next fever peak would probably be the last. Clevering was a dying man.

"What books?" asked Garrison sharply. "There are no books that I know of except the Code."

"The . . . the ones in the Autarch's secret library," managed Clevering through chattering teeth. "A few were stolen years ago by a dissenter who was a palace guard until the monitors found him out. They have been handed down through several generations to trusted fellow believers. I am the last one. There are no others that I know of."

"I am one," said Garrison quietly. He was astonished at his own coolness when he said it; for twenty-four hours earlier he would have allowed wild horses to pull him apart rather than utter the blasphemous words. Now all that was changed.

"I am seeing people die who should not be dying," he explained. "I don't like it. The Code is—" here he almost choked on the words, such is strength of inhibiting doctrine, "the Code is—well, the Code is all wrong! It's got to be changed. It's got to be repealed!"

"I believe you," said Clevering, and pulled Garrison toward him so he could whisper, "the books are under a false flooring in a shed—"

Garrison listened attentively to the instructions, but before the patient quite finished, the fever got the better of him and he rambled off into incoherent nonsense. Garrison stayed on, for it was not all nonsense. There were lucid stretches in which Clevering lived his experiments again—the trying of this or another spray on the blights, and the application of various chemicals to learn which helped the corn and discouraged the weeds. At length the end came, and there was no more to do. Neomal had claimed another victim, this one appallingly swiftly. Garrison removed the plug of cotton and softly left the room.

Garrison's life for the next five weeks was a frenzied jumble of concealed activity. Taking infinite care to wear the mask of common apathy, and covering his movements with studied casualness, he steadfastly pursued two aims. One was the reading of the forbidden books, which he dug up during his first available free time. Thereafter he read them in his room, hiding them meanwhile in his mattress. The books were a strangely variegated lot. Some were on scientific subjects, others social or philosophic. There was history, too, and something about religion. The book he came to love most of all was a very slim one—a

little volume on "Liberty" by a John Stuart Mill. His limited vocabulary troubled him much at first, but he shrewdly arrived at the meanings of such words as "choice" and "freedom" by considering the context. He discovered to his delight that there were shades between good and bad. There were the words "better" and "best" as well as the bare, unqualified "good."

While the books opened up vistas unimaginable to his thinking, it was at Sanitar that he performed his most imperative work. He wanted to find out why neomalitis had suddenly turned killer, and how to foil it. On the pretense of checking the biologists, he pored over blood and lymph specimens of the ever arriving patients. He built up culture colonies, and then tried to destroy them with modifications of the sulfa drug. The results were negative, so he tried other compounds. Then he cultured viruses, and pitted one strain against another. And as the average Psychic Resistance Index kept dropping lower he pondered that feature. Apparently the Diagnostats were not calibrated for patients so consistently depressed and without desire to live, for shortly the uncanny machines balked at giving any prognosis whatever. All that would come out was a meaningless jumble of characters.

At last the day came when he found a drug that killed the new strain of neomal bacilli in the laboratory. He was careful to restrain any expression of joy, though his impulse was to leap into the air and yell "Eureka!" Instead, he cautiously loaded a number of hyperdermic needles and wandered into a ward.

He sent the attendants away on various errands, and set about the risky job he was compelled to do. He injected all the patients in the rooms on the left-hand side of the corridor. Then he went as soon as possible to his office and awaited results.

They were not long in coming. Within the hour an agitated treater rushed in.

"All hell has broken loose in 44-B," he reported. "It *can't* be neomalitis those patients have. They're in convulsions."

"I'll be right down," said Garrison. His bones had turned to water, but he had to see the thing through. He knew, from his belated reading, that one was supposed to experiment on guinea pigs and monkeys before injecting strong and untried medicines into human beings. But there were no longer any such animals. They had been decreed useless and were long extinct. Yet the patients were doomed anyhow—he felt

justified in taking the chance. But he had not foreseen convulsions.

By the time he reached the ward the worst of the spasms had subsided. Some of his inoculated patients had succumbed in their agony. The remainder lay spent and gasping, with expressions of utmost horror on their faces. Garrison surveyed them stonily, but his heart was cold with anxiety.

"Very odd," he remarked, making notes. "I shall report it, of course."

He was too upset to do anything else that day, but that night he thought long and hard about it. The following morning he learned to his immense relief that only a few more of his illegally injected patients had died, whereas the half ward under Code treatment had lost its normal number—about eighty percent. During the tense day that followed, the survivors among his experimental subjects began to rally. By nightfall several had lost all symptoms. In a day or so, barring relapses, they could be discharged.

"I'm on the track," Garrison exulted. "Perhaps I used too strong a solution."

He attacked the problem with renewed fury. Day after day he tried dilutions and admixtures of other chemicals. There were unhappy results at times, but on the whole he was making splendid progress. At last there came a day when there were no deaths among the ones he treated by stealth. A grand glow of achievement warmed him, and when he returned to his office he could not help walking like one who had conquered the Earth. He had tried, fumbled, and then gone over the top. Now he understood the rewards that come to those who achieve by their own wit and handiwork.

But there was another kind of reward awaiting him. At the door of his office two grim monitors met him. They shut off his remonstrances with a blow across the face. Then he was hustled into an elevator and shot to the top of the tower where an angry director was pacing the floor. A smug inspector of pharmaceuticals was standing by with a packet of inventory sheets.

"Explain yourself, sirrah!" snorted the pompous, red-faced man who headed Sanitar. "What do you mean by forging chemical withdrawals? Sulfa drugs—pah! You have not used a gram of sulfazepropionyl in ten days. Instead you—"

"Instead, I have been saving the lives of my patients," said Garrison quietly. "I gave them the Code stuff and they died, just as

they are doing in the other wards. Therefore I knew that—"

"Silence!" roared the director, shutting him off. "Not a word more. Nothing . . . *nothing*, mind you . . . is as hideous as willful violation of the Code. What does it matter whether a thousand or more weaklings die? It is better so than to return to chaos. Monitors, do your duty!"

The monitors did their duty. They did it precisely as the Penal Code said they must, exactly as it had been found necessary in the early days when there were many rebels, and those tough and fearless. They flung chains about his wrists and dragged him to the elevator, kicking and cuffing him at every step. They paraded him through the great lobby on the ground floor for the edification of his brother ratings. And then they hurled him half unconscious into the waiting prison van. After that for awhile Garrison hardly knew what happened to him. There was a prolonged session under a dazzling light, during which venomous voices hurled abrupt questions at him. They injected him with scopa, and they brought psychomeds of the Penal branch to try hypnosis on him. They beat him at intervals, and confronted him with the books they had uncovered in his room.

"You are fools, fools, FOOLS, I SAY!" he screamed when he could stand it no more. "Yes, I had an accomplice. His name was Clevering . . . Clevering the agronomist. He's dead now, so it does not matter. He kept the weeds out. He kept the blight out. So you have corn. That was contrary to the Code, but you have it!"

That was when his memory ceased to register. The things they did to him after that did not matter. Or they did not matter until hours later when he found himself crawling miserably on the hard steel floor of a cell. He felt his wounds and the stickiness of them made him faint again. After that he slept for many hours.

How many days he languished, sore and battered and hungry, in the dark he had no notion. He was hauled out one day for questioning by a solemn board of psychomeds. That was to determine his sanity. He answered them defiantly from between swollen lips and with words that had to be mumbled for lack of teeth. They overwhelmed him with scorn, and pronounced him sane. The Penal Code could take its course. After that there was more of darkness. Not one person in Sanitar or from

Dorm attempted to communicate with him. He was unclean. He was different. He was a convicted dissenter. His name was already erased from the roster of the living.

It was an eternity after that when the four burly monitors came in the dead of night. He heard the heavy tramp of their feet in the corridor, and the crash as his door was thrown open. Then hand flashlights played on him.

"Up, snake!" snarled one, and yanked him to his feet.

"Don't mark him any more," warned another. "The captain said not. The Autarch is going to work on this one in person, and they say he likes 'em fresh and able to take it."

The other monitors snickered, and something whispered was said that Garrison's ears did not catch. Then he was shoved into the desolate corridor and propelled forward. Next came a jolting, mad ride to the airport, and then comparative quiet as the giant stratoplane soared through the sky. Sometime later there was another ride in a van, with a stop after a bit for challenges and explanations. Then Garrison heard the creak of great bronze gates opening on seldom used hinges, after which he was handed through a door and into a small elevator.

The moment he stepped out he knew he must be in the palace. He had not imagined such grandeur. The floors were heavily carpeted in rich designs, and the walls glowed with an eerie softness. Uniformed flunkies and guards stood everywhere, eying him curiously. Garrison became painfully aware of his own drab appearance, for he wore only a very dirty shirt badly stained with blood, and his body was encrusted with the muck of his cell floor. His beard had grown untouched since the first day of his incarceration. Add his bloodshot eyes and battered features to that and he knew he must present a perfect picture of a desperate criminal.

A silver robed official of the palace intercepted them.

"Oh, he can't go in like that," he said. "He'll have to be washed. This way with him."

Garrison felt better after the repair work was done. He had resigned himself to taunts and tortures and ultimate death, but it felt good to be clean for once. They even trimmed his hair and shaved him, and dressed him fully with dark-blue silken clothes after applying pleasing ointments to his welts.

"You needn't mock," Garrison cried out, as they slipped the smooth cloths onto him. "I am a dissenter and proud of it. Let's get on with it."

"Take it easy," said the treater who had patched him up. "The Autarch would not have sent for you if you had been just an ordinary case."

They gave him a sweet mixture of chocolate and milk and put him in a darkened room to rest awhile, telling him that his audience was not to be until noon. He tried to rest, but could not. Too much was running around inside his head. He knew that he was condemned to die, for the monitors had told him as much. His hope was that before the hour came he could at least get the reason for his rebellion on the record.

An officer of the guard came and escorted him down the carpeted halls. This time there were no harsh words or cuffing, but stiff civility. He took him to a pair of richly paneled doors which two flunkies drew open. Garrison was told to go in, and the doors closed silently behind him. He had entered alone; the officer remained outside.

It was an immense square room, luxuriously appointed, and facing him was a massive desk beside which stood a man he knew must be the Autarch. He was a magnificent specimen of manhood, tall, barrel-chested, and commanding. He wore a robe of wine-red satin bound with cloth of gold, but his gray-streaked leonine head was bare. His gaze was steady on Garrison—a coldly appraising gaze from hard blue eyes, and under them an unsmiling mouth of iron. When he spoke it was with a deep and vibrant voice without a trace of emotion in it.

"So you are a rebel," said the Autarch, almost as if he were speaking to himself.

"I am."

Garrison was desperately afraid he was about to tremble, for the man's personality was overpowering, and nothing in his previous career had conditioned him to cope with it.

"Why?"

"I was failing in my job . . . despite the Code," said Garrison slowly, "and I felt I should do something about it. I did, and succeeded, after a fashion. I saved the lives of some of our citizens. That is my crime. If I had it to do over again, I would do the same."

"Ah," said the Autarch, taking a deep breath. "So you defy me?"

"You do not understand, or you would not call it defiance," said Garrison, astonished at his own boldness. But he had already suffered death a hundred times in anticipation and was beyond fearing it. Nothing mattered now. The Autarch frowned momentarily, but continued to size up his prisoner for a minute or so more.

"A real rebel, a genuine, sincere dissenter," he said softly, "at last."

He moved across the room.

"Sit down," he said, "I want to talk with you."

Garrison sat down and took the proffered cigarette, wondering whether he was on the cruel end of the cat-and-mouse game.

"During my reign," said the Autarch, "I have long wanted to meet one of you. From time to time they have brought me what was alleged to be such. They were sniveling cowards all—stupid, lazy, careless or inept people who had infringed the Code without intent. They had to die, of course, and did. It is the rule, and I am as helpless in the face of it as anyone. But I did hope to find out what was wrong with the world. They could not tell me. Perhaps you can. There is more than one way of dying, I may remind you, and I have considerable latitude in that matter."

"I see," said Garrison. Things were churning about inside his skull. There was the temptation to tell his captor what he wanted to hear and thereby earn a painless death. Yet he did not know what the Autarch wanted. Besides—

"The trouble with the world," said Garrison carefully, "is the Code itself. Civilization is an organism, made up of a myriad of lesser organisms. Organisms—men, animals, plants, and on down into the microcosm of minute life—are living things. They grow and develop and evolve. Or else they degenerate. They never stand still. Only the Code stands still. It is too rigid."

"I am not prepared to admit that," said the Autarch, "but go ahead. Prove your point if you can."

It was the opening Garrison hungered for. He recited the recent behavior of neomalitis—the strange turn it was taking, and the helplessness of the doctors in the face of an uncompromising Code. He explained how bacilli could differentiate into fresh and harder strains, more contagious and deadlier than their predecessors. And how they might become immune to treatments formerly effective. Then he detailed his own

experimentation, handicapped as that was by non-co-operation and the necessity of secrecy. He mentioned Clevering and his cornfields and emphasized the parallelism between the two situations. The conclusion was inescapable. However good the old procedures may have been in their day, they were not valid now. Radically new approaches were demanded.

"Perhaps," agreed the Autarch, thoughtfully. "There appears to be truth in what you say. I may as well tell you that other diseases are becoming rampant as well—new varieties of cholera, dysentery, and pneumonia. There is a wave of suicides, too. Cattle are dying. Many of our vital crops are failing from blight or insect attack. That is not all. Nonorganic things are awry. Despite controls, gradual shifts of population have thrown central power plants out of balance, and left us with highway systems that are either congested or disused."

"A city or region may be regarded as an organism, too," Garrison reminded him.

"So I see. At any rate, it is a problem that has weighed on me for some time. It is growing urgent. Something must be done, and quickly."

"I know that," said Garrison dryly.

"If," suggested the Autarch, "I should see my way clear to grant you an indefinite reprieve—perhaps amounting to a full pardon—would you undertake to bring the diseases mentioned under control?"

Garrison smiled a thin, hard smile.

"I am only one man, excellency, and an ill-equipped one at that. I happened to be lucky in stumbling on the remedy right off. In another case it might take an army of research workers years. Only by putting thousands of trained men at it in ample laboratories could such a thing be done."

"Very well. You are the new Director General of Health. I delegate you to find such men and modify the Medical Code."

"How?" asked Garrison, with a short, scornful laugh. "It is too late for that—by a half dozen generations. Not to modify the Code, but to find the men. The kind of men we need do not develop under an autarchian regime. It is the senseless persecution of your predecessors that has brought us to the brink of ruin, not the plant and animal parasites you complain of. Free men would have disposed of them long ago. But that would have required initiative and adaptability, traits long since obliterated. Now the premium is on blind obedience. Men

have lost the art of thinking; they will only do what they are told."

"That makes it all the easier," said the Autarch, reaching for a pad. "You write the order stating what you want done. I will promulgate it. It is as simple as that."

Garrison stared at him in blank amazement.

"Order what?" he asked. "Men of force and talent to reveal themselves? Who is to judge whether they have those qualities? And if there are such, they will take immense pains to conceal themselves. They are afraid. I know that, because I know my own reaction to your recent order relaxing the Social Code. I didn't understand it, and I didn't trust it. For all I knew the Monitors might be listening and taking it all down."

"They were," said the Autarch, "but nothing happened. I was worrying about the state of affairs throughout the world, and hoped to pick up a clue as to what was wrong. There was only silence."

"Ah," said Garrison, grimly. "That shows the effect of fear. And the deadliness of inertia. There must be many men among our billions who see what is happening and care, but they dare not speak. They see only the Penal Houses ahead for their pains. As to the vast majority . . . bah, they are sheep. They are accustomed only to orders from above. Without positive orders specific to the last little detail, they will not act. What else do you expect from a race of slaves?"

"Slaves!" exclaimed the Autarch. "In the high position you held, how dare you compare yourself with a slave?"

"Wasn't I? I could cast about and find a sweeter euphemism for it, but essentially that was it. I have never known anything but regimentation. I was flattered with the label of a high cerebrad rating, but why they assigned me to my job on the basis of it is more than I can understand. The commonest field hand above the moron class could have done the work I did. A machine could have. What use is intelligence if you are not permitted to use it?"

"Yes," admitted the Autarch slowly, "I see that now. But that was then. You are not only permitted to use yours now, but ordered to. Use any means you please to assure them immunity from persecution, but issue your call—"

"It will take more than negative action," Garrison reminded him. "To break away from a life of routine a man needs positive motivation. And I do not mean promotion

to a job as sterile as the one he has. It will have to be one to fire his soul and kindle his mind. Simply writing an order will not suffice."

There was an interruption. The majordomo of the Palace brought in a folder of papers. It was the weekly summary of events in Autarchia. The Autarch studied it with a face of thunder, then handed it to Garrison.

It was a story of regression on all fronts. The worst news came from Asia, where the strange disease that resembled cholera but responded to none of its known controls was sweeping the continent. Millions were already dead, and every ship and stratoplane was spreading the epidemic farther.

"In the absence of anything better," Garrison remarked, "this should be isolated. You should declare an immediate quarantine."

"What is that?"

Garrison told him.

"That is out of the question," decided the Autarch, after a moment's consideration of what it implied. "It would be disastrous. The entire workings of the Code hinge on dependable supply and distribution. It—"

"It," flared Garrison, "shows you how rotten your precious system is. Even you, presumably the ablest man of us all, are stopped by it, though millions die. When things start cracking you're sunk. The holy framers thought they had attained perfection and saw no alternative. Well, cling to your sacred Code and ride to doom with it. But let's end this farce. Call your executioner and finish it."

They were both on their feet on the instant. The Autarch was visibly trying to control his anger, but Garrison was not to be stopped. The sickening sense of futility he first felt when Leona McWhisney died was back with him, a hundredfold more strong. His voice rose shrilly, and he threw discretion to the winds.

"The race is facing a life-and-death crisis," he shouted. "Pestilence is here, and famine is right around the corner. In the wake of those will come economic pandemonium. The Grand Code cannot cope with them. It was not designed to. All it does is stifle us. What we need is men of imagination and boldness, not content with covering themselves by complying with some stereotyped provision of the Code. We need them by the tens of thousands, and we cannot find them on account of this un-

wieldy body of stupid, frozen laws. There is no time for temporizing. The Code has got to go—lock, stock and barrel!”

Garrison said a lot else along the same line. The Autarch heard him out in moody silence. Then he grasped him by the arm and led him to a side door.

“My apartment is in there. Go rest. I believe there is something in your argument, but I want to think.”

That interview was the beginning of a curious friendship. They dined together that evening, and later talked far into the night.

By the end of the week Garrison came to appreciate that the office of Autarch was as empty as any in the realm. There, too, the dead hand of the past lay heavily. Being top dog of the pyramid of bureaucracy meant little, for in Autarchia precedent ruled. Autarchs had occasionally added to the Code, but not one had ever repealed a provision.

The books confiscated at the time of Garrison's arrest were sent for by the Autarch. He was amazed at their contents, and began to understand better the workings of his guest's mind. He liked the technical ones best; the one he could stomach least was the little essay by Mill. The idea of an individualistic society was beyond his comprehension, but on the whole he was impressed.

“Garrison,” he said, “I am convinced you have more practical ideas than I. I am ready now to take advice. We will modify the Code for the emergency. You write the orders, I will issue them.”

“I won't do it,” said Garrison. “I don't know enough. And if I did, I still wouldn't. The principle is wrong.”

“What principle?”

“The principle of handing down wisdom from aloft. The principle of autocracy, if you want to know. It is an evil thing. History has never produced a man who knew everything—”

“He can surround himself with advisers.”

“Of his own picking,” countered Garrison.

“Yes—men they used to call them. Which is worse. It is a device to reinforce a dictator's illusions as to his own infallibility. What he needs is not a chorus of indiscriminating yessing, but frank and brutal criticism. He can get that only in a democracy.”

“Democracy!” cried the Autarch scornfully. “Anarchy, you mean. What is a democracy but a howling mob of forty opinions, each as little informed as the

next? Where, after an infinity of muddling and compromise, some self-styled leader manages to wheedle an agreement among fifty-one out of a hundred of the mass, whereupon he proclaims a half truth as the whole. That is clumsy nonsense. The world had democracies once. Look what happened to them!”

“Look at what is happening to their flawless successors,” said Garrison quietly.

The Autarch reddened.

“At least,” Garrison argued, “in a democracy the ordinary man had something to live for. He wasn't a poor pawn. If he hit on a good idea and had the will and personality to promote it, he had a chance of getting somewhere. He didn't vegetate or degenerate into the flesh-and-blood robots we have about us now. Competition with his fellows kept him from doing that. Sure, he made errors. But he did not make the stupidest of all—of freezing them into an inflexible Code. Where freedom is, a man can develop. If he is wrong, others are free to say so. Some will back him, others oppose, which is the very thing the framers of the Code thought so deplorable. But out of the conflict the better idea usually won.”

“After years of wrangling and with many setbacks,” objected the Autarch.

“Rather, after continual adjustments to current needs,” corrected Garrison. Democracy may have had its faults, but lack of adaptability was not one of them. In freedom of speech and reasonable freedom of action it had the machinery for correcting any intolerable fault. Which is more than you can say for your own absurd system.”

“All right,” retorted the Autarch. “For argument's sake suppose I grant your point. *How*, in view of the sheeplike nature of my people which you keep harping on, could we reinstitute an obsolete form of society such as you advocate? I offered 'em free speech, and you know what happened.”

“Wake 'em up,” yelled Garrison. “Make 'em mad. Then you'd see.”

“With no Code to guide them? I see nothing but chaos.”

“We needn't repeal the whole of the Code. Considered as a guide it isn't bad at all. Its evil feature is its pretence of being infallible. We'll teach the people how to judge when to follow and when to diverge.”

“That from you,” snorted the Autarch. “You, who wouldn't even tackle the revision of the Medical Code! Now you propose to upset the entire appercart, and destroy the people's confidence. What will

you replace it with, and how?"

"What with?" smiled Garrison. "There is always your great sealed library. You have seen a small sample of it and liked it. The Code was based on it. It must be good. As to how, that will come later.

"Let's look," said the Autarch, with sudden resolution. He dug keys and combinations out of a safe.

They reached the library through a long underground passage heavy with the dust of time. Once they passed the guards at the outer barrier they were on pavement untrod for decades. Then they came to a heavy circular door that had to be opened by a complicated group of methods. At length it swung open and they stepped through.

Both gasped at the immensity of the place. Not every book ever published was there—only the ones considered by the framers in compiling the Code. But since they covered every field of human activity in utmost detail, they numbered in the millions. The stacks stretched away for thousands of feet of well-lit, air conditioned space. The magnitude of the task they had so lightly assumed almost overwhelmed them.

After a long hunt Garrison found the medical section. He was again appalled at the extent of it, for the volumes dealing with any single aspect of his profession took up yards of shelving. He skipped histology, obstetrics, dermatology, and dozens more. There was just too much of it. How was he ever to read it all, let alone sift the chaff from the substance? He ducked the questions neatly by concentrating on the volumes devoted to the techniques of research.

Meanwhile the Autarch was delving elsewhere. He was deep among the histories and philosophies, with occasional excursions into political economy. Soon the aisles where he roamed were cluttered with "must" books. His first samplings had produced material for half a lifetime of study.

Hours later they left the place, exhausted, but burdened with books. Sheer fatigue cut their dinner talk that night to the barest minimum.

"How can we know," groaned the Autarch, "what part of this stuff is bad, and what not?"

"We'll have to leave it to the people," was Garrison's reply. "We need too many people and in too many varied fields to try to select for them. They will have to do that themselves."

"That will bring chaos, I say," grumbled the Autarch. "Anarchy. Your cure is as bad as the disease, I'm afraid."

"All right," grinned Garrison, as a sudden inspiration hit him. "I'm an anarchist. Let's analyze it. Autocracy is the complete denial of the individual. Anarchy is his fullest possible assertion. Democracy lies halfway between. Under it an individual can be himself, but is subject to certain restraints. Very well. You continue to play the Autarch. I'll be the Anarch—"

"And between us we'll produce the Demagogue," remarked the Autarch, sharing his grin. "A fascinating gamble, I must say. And pray tell, my insane friend, how do we achieve this miracle?"

"You continue to issue edicts."

"Yes?"

"And I will see that they are not obeyed," chuckled Garrison.

Strange happenings came to pass shortly after that. The sprawling radio center known as Omnivox overflowed into adjoining buildings hastily remodeled as annexes. Peremptory calls were sent out to Propags all over the world. Soon they came streaming into Cosmopolis on every arriving strato-liner. There they met a puzzling individual—one Philip Garrison, the newly appointed Chief of Propaganda. He told them that for one month they would read and not talk. In the meantime the standard lecture courses were to be suspended.

At the same time the citizens of the provinces were treated to a bewildering succession of orders. The Grand Code, they were informed, was to be revised in the near future. Until that time they should continue to use it as a guide, but might depart from it in certain stated emergencies. Propag lectures stopped as the lecturers were withdrawn, but the culture courses were continued for the time being. There was a difference, though. An army of carpenters descended on the various Social Halls and cut them up into many small compartments by partitions. Each was fitted with an omnivox screen. The most startling innovation was the broadcast instructions to the Monitor Corps. They were forbidden to molest dissenters. On the contrary, they were given strict orders to protect them from the orthodox, should those show signs of resenting their heresies.

The results as both Autarch and Garrison had anticipated, were meager. They listened in at random over the monitorial wires and

knew. For a few days there was a buzz of excitement, then the people relapsed into their customary apathy. They continued to do the things they always had done, and in exactly the same manner. In all the world there were less than five hundred who took the strange edicts at anything like face value. Some were doctors, who now openly experimented as Garrison had done. The rest were in other professions.

The Autarch wanted to send for them and add them to his staff.

"No," said Garrison, "they will be more useful where they are. Moreover, if you do that you may scare others. There must be more than half a thousand alert minds on five continents. We've still got those to smoke out."

The preliminaries took the whole of the estimated month. The zero hour was near at hand. The Propags had finished their assigned readings and had prepared their scripts. The Autarch was signing them at the rate of hundreds at a time, using a giant pantograph. Each was in the form of an edict, almighty law to replace a portion of the outmoded Grand Code. For the first few hours he tried to read them as they came, but there were too many. He gave it up and went ahead with his part of the bargain—signing orders, for in the end he and Garrison had arrived at a complete understanding. Now he meant to see it through, though the skies fell.

He checked off the subjects on his lists as the edicts went on their way. There appeared to be one set missing. He sent for Garrison. Garrison was busy at the time coaching the regiment of omnivox announcers he had recruited.

"What about religion?" asked the Autarch. "There was about an acre of books on it, as I remember."

"Oh, yes, religion," said Garrison, thoughtfully. "Yes, I suppose we ought to include that, though I omitted it because it was one of the activities abolished altogether."

"I think we'd better give it to 'em," said the Autarch. "People used to think a lot of it. They fought over it. It had something to do with the spirit, I believe, and we certainly need pepping up in that direction."

"Yes," agreed Garrison. "What kind shall I dish out?"

"How would I know? Let 'em have all of it."

So Garrison put another hundred script writers to work.

At last zero hour came. Garrison was in the master control room of Omnivox with stop watch in hand. At his nod the talkers went into action. It was the hour when the citizens in his part of the world were assembled in the Social Halls. At later hours the same discourses would follow the sun around the globe. Then he went off to his private booth and plugged in on a spylene. For a sample spot he picked on the Hall at his old home Dorm. It was different now. Instead of being scattered groups in one big hall, the doctors and agronomists were segregated in many small rooms. Each was listening to a different lecture. Garrison chose to follow the doctors.

In the first room a group of them were listening rapt to the new orders that were to replace the Code. The voice proclaiming that particular one was reading from a script that declared that most bodily ills had endocrine gland imbalance as their cause. Hence glandular therapy would cure anything. Garrison listened to it well pleased. It was most convincing. Then he switched over to another room. There, other doctors heard the new law of the land. It asserted that diet was nine tenths of the battle. Feed a man right and he would become practically immortal.

Garrison smiled and went on to the next. The lecturer was quoting osteopathic doctrine. The disposition of the bones had everything to do with disease. It was fundamental. Garrison flicked the switch again. The next fellow was yelling about the dangers of ever-present bacteria and demanding strict attention to the sterile technique. On and on it went, in each room a different set of dogma. And each of them was sound enough as far as it went, except that each was emphasized at the expense of every other. All the cults and schisms of old-style medicine were there.

Garrison grinned happily. He could not predict with any exactness what the outcome would be, but he knew it would be worth watching. Then he turned to other fields where similar conflicting lectures were being read. The announcers were doing well; he was content.

"How'm I doing?" he asked the Autarch, ten days later.

"Swell, I guess," said the Autarch dubiously, "if chaos is what you're driving at. There are riots all over the place. I ordered a new bridge built across the river ten miles below here. I had to send a squad of monitors to restore order."

"Yes?"

"Four pontifexes of the steel arch persuasion ganged up one who stood out for a suspension bridge. A fellow who happened to think cantilevers are better horned into the argument and got battered in the melee. Pretty bloody affair."

"They'll learn," said Garrison cheerily. "And when they do, they will not only know what is the best type, but why. They'll feel all the better for it. That's the democratic way."

"Maybe," said the Autarch grudgingly, and added with a twinkle, "You have a thing or two to learn, too."

"Now what?"

"Discrimination. Do you know what happened at Chicago? Better check over your scheduling of religious stuff. They've been preaching Hinduism out there. Now we have a strike on our hands. Hindus won't kill cows, it seems."

In the succeeding six months pandemonium broke loose. It was all according to plan, but trying. The world's population had been divided into cells, and each cell ordered to believe in some particular method and carry it out in the face of every opposition. Since no two groups were taught alike in the same locality, friction developed almost immediately in the citizens' daily work. On Sundays, when all were thrown together for an afternoon of free discussion, the monitors had their work cut out for them. They found their new instructions as to preserving order the biggest job in their history.

But Garrison listened in with glee. The only way to reach the populace was through flat, categorical orders. It was the conflict of orders, each reasonable and workable of itself but incompatible with the others, that was waking them up. Men got angry, and backed up the reasons fed them by the Propags with ones thought up by themselves. Still others were unsettled by their opponents, and wrote troubled letters to their higher-ups asking for clarification. Since their higher-ups were equally as confused, the letters eventually reached the palace. Garrison faithfully recorded their names on a gold-starred list.

"There," he said to the Autarch, "are some of the men you asked for."

"Humph," exclaimed the dictator, "I am getting a lot more than I asked for. Riots. Revolution. Call it democracy if you want to, but anarchy is what it is. You stirred 'em up, I admit, but what has it got us?

A nation at one another's throats. I don't like it. Summon the best of these men you've found and direct them to draw up a new Code. Then—"

"Then we'll be right back where we started," Garrison broke in. "You can't put mankind in a strait jacket and expect anything but atrophy. When our thinking is done for us we become stupid. There is a saying that Nature abhors a vacuum. She also abhors an idler. The unused limb withers and dies."

"But listen to the noise outside," said the Autarch, "they'll be killing each other next."

There was plenty of tumult outside, all right. All Cosmopolis was lit with red flares, and the night was hideous with the roar of crowds and the ranting of stump orators. Autarch and Anarch stole out onto a balcony where they could better see and overhear. A political parade was passing, waving banners aloft that called for the establishment of a monarchy. It met another head-on, a group yelling for an election and the adoption of a constitution. The monitors intervened, swinging nightsticks, and dispersed both crowds. But the relative quiet that followed was short lived. A mob howling "Death to Mohammedans" poured out of a side street. When the monitors finished with them their placards and banners were in shreds.

"I think you overdid the religious angle," remarked the Autarch dryly.

"Yes," admitted Garrison glumly. "I had no idea they would take it so seriously. After all, we don't actually know much about the soul. Ours have been in a state of suspended animation for a long time."

"I know, but don't you think we might be a little more . . . ah-uh . . . *selective* in what we put out. Now that sect we just saw in action, for example—"

"At least we gave the monitors only one set of instructions—to maintain order," said Garrison, doggedly sticking to his guns. "The few broken heads we see are worth the price. It will all work out. Have patience."

It did work out. The Propags had done their job. The seeds had been sown and now the crop was coming up. Controls were being established over diseases and blights again. Other able men were untangling the economic mess resulting from those. Still others were observing and approving them. The Codes were not being used much any more. People attacked their problems directly, and were learning the art of com-

promise. There was but one thing left to do.

The Autarch was reluctant to do it, but he had gone so far that he was willing to go all the way. He revoked the Code, including the fantastic recent additions. The printers that formerly made up its volumes were now turning out copies of the books in the secret library. The only portion of the Code retained was the completely revised Social Code. Into it Garrison wrote the bill of rights and the laws compelling tolerance, and appended instructions for forming a

representative government. He abolished the practice of holding men in jobs by virtue of their cerebral ratings. It might come out to the same thing, and might not. Hereafter results were all that would count.

It was the Autarch who issued the call for the elections, and of his own volition. That was months later, after the new Code had been digested.

"Do you know, Garrison," he said, "this anarchy of yours is panning out pretty well. But I've worked myself out of a job. I think I'll run for president."

EYES TO SEE

ELECTRONIC devices that extend man's range of vision embrace almost the entire known spectrum, and not merely the optical spectrum. Radio is used for vision both indirectly, in transmitting radio-photo services, and directly as an artificial equivalent for Kimball Kinnison's "sense of perception." The infrared spectrum is caught by photocells, or by hypersensitive bolometers, to operate electron amplifiers. The device is a very special type of X-ray tube developed by Westinghouse; it is, to an ordinary X-ray tube, as an Edgerton Speed-lamp is to an incandescent bulb. The Edgerton Speed-lamp system stores energy in a bank of condensers, then smashes the stored energy through a special type of mercury-argon arc lamp. This Westinghouse development stores energy in a similar manner, and discharges it in one tremendous, extremely brief surge through the high-power X-ray tube. The duration of the discharge is so brief, but its intensity so terrific, that X-ray records on photographic film can be made with an effective exposure of one microsecond. Photographs of bullets going into steel armorplate have been made in the past—now X-ray shots showing the bullet during penetration, while inside the steel, are possible.

But electrons are used directly for hyper-vision, too, in the electron microscope. One difficulty of the electron microscope, however, has been the fact that the electronic picture was, essentially, a shadowgraph—the subject under examination was pene-

trated by the electrons, to show its internal structure. One of the most important fields of modern metallurgy, however, is the study of surface phenomena. Corrosion starts at the exposed surface, friction results when two surfaces are in contact, the still-unexplained phenomena of the barrier-layer type rectifiers and photo-sensitive surfaces are surface, or near-surface phenomena. The electron microscope is another Westinghouse trick—it depends on the bounce of electrons from the surface of the material under examination.

Electrons are material particles. One tends to think of electrons as somewhat similar to shadows. You can calculate where the shadow is, what it will do, it has physical reality in an intangible way, you can measure it, predict its appearance and reactions—but it isn't real in a mechanical sense. The electric charge carried by an electron is so stupendous in proportion to its mass—some 100,000,000,000 coulombs per kilogram—that the mass is rather overlooked. But electrons are mechanical realities: this mass of tough, solid copper bears witness to that. Originally, this was an X-ray target, a cylinder of copper cut off by a plane at 45° to its long axis, with a button of platinum inset flush with the angled surface. As a stream of machine-gun bullets would pound a hole in a granite boulder, the 500,000 volt electrons pounded the deep pit in this target.

DEATH SENTENCE

By ISAAC ASIMOV

Our psychologists of today have set up colonies of monkeys and other animals as experiments. On a larger scale, with larger means, a greater experiment could be undertaken—

BRAND GORLA smiled uncomfortably. "These things exaggerate, you know."

"No, no, no!" The little man's albino-pink eyes snapped. "Dorlis was great when no human had ever entered the Vegan System. It was the capital of a Galactic Confederation greater than ours."

"Well, then, let's say that it was an ancient capital. I'll admit that and leave the rest to an archaeologist."

"Archaeologists are no use. What I've discovered needs a specialist in its own field. And you're on the Board."

Brand Gorla looked doubtful. He remembered Theor Realo in senior year—a little white misfit of a human who skulked somewhere in the background of his reminiscences. It had been a long time ago, but the albino had been queer. *That* was easy to remember. And he was still queer.

"I'll try to help," Brand said, "if you'll tell me what you want."

Theor watched intently, "I want you to place certain facts before the Board. Will you promise that?"

Brand hedged, "Even if I help you along, Theor, I'll have to remind you that I'm junior member of the Psychological Board. I haven't much influence."

"You must do your best. The facts will speak for themselves." The albino's hands were trembling.

"Go ahead," Brand resigned himself. The man was an old school fellow. You couldn't be too arbitrary about things.

Brand Gorla leaned back and relaxed. The light of Arcturus shone through the ceiling-high windows, diffused and mellowed by the polarizing glass. Even this diluted version of sunlight was too much for the pink eyes of the other, and he shaded his eyes as he spoke.

"I've lived on Dorlis twenty-five years, Brand," he said, "I've poked into places no one today knew existed, and I've found things. Dorlis was the scientific and cultural

capital of a civilization greater than ours. Yes it was, and particularly in psychology."

"Things in the past always seem greater." Brand condescended a smile. "There is a theorem to that effect which you'll find in any elementary text. Freshmen invariably call it the 'GOD Theorem.' Stands for 'Good-Old-Days,' you know. But go on."

Theor frowned at the digression. He hid the beginning of a sneer, "You can always dismiss an uncomfortable fact by pinning a dowdy label to it. But tell me this. What do you know of Psychological Engineering?"

Brand shrugged, "No such thing. Anyway, not in the strict mathematical sense. All propaganda and advertising is a crude form of hit-and-miss Psych Engineering—and pretty effective sometimes. Maybe that's what you mean."

"Not at all. I mean actual experimentation, with masses of people, under controlled conditions, and over a period of years."

"Such things have been discussed. It's not feasible in practice. Our social structure couldn't stand much of it, and we don't know enough to set up effective controls."

Theor suppressed excitement, "But the ancients *did* know enough. And they *did* set up controls."

Brand considered phlegmatically, "Startling and interesting, but how do you know?"

"Because I found the documents relating to it." He paused breathlessly. "An entire planet, Brand. A complete world picked to suit, peopled with beings under strict control from every angle. Studied, and charted, and experimented upon. Don't you get the picture?"

Brand noted none of the usual stigmata of mental uncontrol. A closer investigation, perhaps—

He said evenly, "You must have been misled. It's thoroughly impossible. You can't control humans like that. Too many variables."

"And that's the point, Brand. They weren't humans."

"What?"

"They were robots, positronic robots. A whole world of them, Brand, with nothing to do but live and react and be observed by a set of psychologists that were *real* psychologists."

"That's mad!"

"I have proof—because that robot world still exists. The First Confederation went to pieces, but that robot world kept on going. It still exists."

"And how do you know?"

Theor Realo stood up, "Because I've been there these last five years!"

The Board Master threw his formal red-edged gown aside and reached into a pocket for a long, gnarled and decidedly unofficial cigar.

"Preposterous," he grunted, "and thoroughly insane."

"Exactly," said Brand, "and I can't spring it on the Board just like that. They wouldn't listen. I've got to get this across to you first, and then, if you can put your authority behind it—"

"Oh, nuts! I never heard anything as— Who is the fellow?"

Brand sighed, "A crank, I'll admit that. He was in my class at Arcturus U. and a crack-pot albino even then. Maladjusted as the devil, hipped on ancient history, and just the kind that gets an idea and goes through with it by plain, dumb plugging. He's poked about in Dorlis for twenty-five years, he says. He's got the complete records of practically an entire civilization."

The Board Master puffed furiously. "Yeah, I know. In the telestat serials, the brilliant amateur always uncovers the great things. The free lance. The lone wolf. Nuts! Have you consulted the Department of Archaeology?"

"Certainly. And the result was interesting. No one bothers with Dorlis. This isn't just ancient history, you see. It's a matter of fifteen thousand years. It's practically myth. Reputable archaeologists don't waste too much time with it. It's just the thing a book-struck layman with a single-track mind would uncover. After this, of course, if the business turns out right, Dorlis will become an archaeologist's paradise."

The Board Master screwed his homely face into an appalling grimace. "It's very unflattering to the ego. If there's any truth in all this, the so-called First Confederation

must have had a grasp of psychology so far past ours, as to make us out to be blithering imbeciles. Too, they'd have to build positronic robots that would be about seventy-five orders of magnitude above anything we've even blueprint. Galaxy! Think of the mathematics involved."

"Look, sir, I've consulted just about everybody. I wouldn't bring this thing to you if I weren't certain that I had every angle checked. I went to Blak just about the first thing, and he's consultant mathematician to United Robots. He says there's no limit to these things. Given the time, the money, and the *advance in psychology*—get that—robots like that could be built right now."

"What proof has he?"

"Who, Blak?"

"No, no! Your friend. The albino. You said he had papers."

"He has. I've got them here. He's got documents—and there's no denying their antiquity. I've had that checked every way from Sunday. I can't read them, of course. I don't know if anyone can, except Theor Realo."

"That's stacking the deck, isn't it? We have to take his say-so."

"Yes," in a way. But he doesn't claim to be able to decipher more than portions. He says it is related to ancient Centaurian, and I've put linguists to work on it. It can be cracked and if his translation isn't accurate, we'll know about it."

"All right. Let's see it."

Brand Gorla brought out the plastic-mounted documents. The Board Master tossed them aside and reached for the translation. Smoke billowed as he read.

"Humph," was his comment. "Further details are on Dorlis, I suppose."

"Theor claims that there are some hundred to two hundred tons of blueprints altogether, on the brain plan of the positronic robots alone. They're still there in the original vault. But that's the least of it. He's been on the robot world itself. He's got photocasts, teletype recordings, all sorts of details. They're not integrated, and obviously the work of a layman who knows next to nothing about psychology. Even so, he's managed to get enough data to prove pretty conclusively that the world he was on wasn't . . . uh . . . natural."

"You've got that with you, too."

"All of it. Most of it's on microfilm, but I've brought the projector. Here are your eyepieces."

An hour later, the Board Master said,

"I'll call a Board Meeting tomorrow and push this through."

Brand Gorla grinned tightly, "We'll send a commission to Dorlis?"

"When," said the Board Master dryly, "and if we can get an appropriation out of the University for such an affair. Leave this material with me for the while, please. I want to study it a little more."

Theoretically, the Governmental Department of Science and Technology exercises administrative control over all scientific investigation. Actually, however, the pure research groups of the large universities are thoroughly autonomous bodies, and, as a general rule, the Government does not care to dispute that. But a general rule is not necessarily a universal rule.

And so, although the Board Master scowled and fumed and swore, there was no way of refusing Wynne Murry an interview. To give Murry his complete title, he was under secretary in charge of psychology, psychopathy and mental technology. And he was a pretty fair psychologist in his own right.

So the Board Master might glare, but that was all.

Secretary Murry ignored the glare cheerfully. He rubbed his long chin against the grain and said, "It amounts to a case of insufficient information. Shall we put it that way?"

The Board Master said frigidly, "I don't see what information you want. The government's say in university appropriations is purely advisory, and in this case, I might say, the advice is unwelcome."

Murry shrugged, "I have no quarrel with the appropriation. But you're not going to leave the planet without government permit. That's where the insufficient information comes in."

"There is no information other than we've given you."

"But things have leaked out. All this is childish and rather unnecessary secrecy."

The old psychologist flushed. "Secrecy! If you don't know the academic way of life, I can't help you. Investigations, especially those of major importance, aren't, and can't be, made public, until definite progress has been made. When we get back, we'll send you copies of whatever papers we publish."

Murry shook his head, "Uh-uh. Not enough. You're going to Dorlis, aren't you?"

"We've informed the Department of Science of that."

"Why?"

"Why do you want to know?"

"Because it's big, or the Board Master wouldn't go himself. What's this about an older civilization and a world of robots?"

"Well, then, you know."

"Only vague notions, we've been able to scabble up. I want the details."

"There are none that we know now. We won't know until we're on Dorlis."

"Then I'm going with you."

"What!"

"You see, I want the details, too."

"Why?"

"Ah," Murry unfolded his legs and stood up, "now *you're* asking the questions. It's no use, now. I know that the universities aren't keen on government supervision, and I know that I can expect no willing help from any academic source. But, by Arc-turus, I'm going to get help this time, and I don't care how you fight it. Your expedition is going nowhere, unless I go with you—representing the government."

Dorlis, as a world, is not impressive. Its importance to Galactic economy is nil, its position far off the great trade routes, its natives backward and unenlightened, its history obscure. And yet somewhere in the heaps of rubble that clutter an ancient world, there is obscure evidence of an influx of flame and destruction that destroyed the Dorlis of an earlier day—the greater capital of a greater Federation.

And somewhere in that rubble, men of a newer world poked and probed and tried to understand.

The Board Master shook his head and then pushed back his grizzling hair. He hadn't shaved in a week.

"The trouble is," he said, "that we have no point of reference. The language can be broken, I suppose, but nothing can be done with the notation."

"I think a great deal has been done."

"Stabs in the dark! Guessing games based on the translations of your albino friend. I won't base any hopes on that."

Brand said, "Nuts! You spent two years on the Nimian Anomaly, and so far only two months on this, which happens to be a hundred thousand times the job. It's something else that's getting you." He smiled grimly. "It doesn't take a psychologist to see that the government man is in your hair."

The Board Master bit the end off a cigar and spat it four feet. He said slowly, "There

are three things about that mule-headed idiot that make me sore. First, I don't like government interference. Second, I don't like a stranger sniffing about when we're on top of the biggest thing in the history of psychology. Third, what in the Galaxy does he want? *What is he after?*

"I don't know."

"What *should* he be after? Have you thought of it at all?"

"No. Frankly, I don't care. I'd ignore him if I were you."

"You would," said the Board Master violently. "You would! You think the government's entrance into this affair need only be ignored. I suppose you know that this Murry calls himself a psychologist?"

"I know that."

"And I suppose you know he's been displaying a devouring interest in all that we've been doing."

"That I should say, would be natural."

"Oh! And you know further—" His voice dropped with startling suddenness. "All right, Murry's at the door. Take it easy."

Wynne Murry grinned a greeting, but the Board Master nodded unsmilingly.

"Well, sir," said Murry bluffly, "do you know I've been on my feet for forty-eight hours? You've got something here. Something big."

"Thank you."

"No, no. I'm serious. The robot world exists."

"Did you think it didn't?"

The secretary shrugged amiably. "One has a certain natural skepticism. What are your future plans?"

"Why do you ask?" The Board Master grunted his words as if they were being squeezed out singly.

"To see if they jibe with my own."

"And what are your own?"

The secretary smiled. "No, no. You take precedence. How long do you intend staying here?"

"As long as it takes to make a fair beginning on the documents involved."

"That's no answer. What do you mean by a fair beginning?"

"I haven't the slightest idea. It might take years."

"Oh, damnation."

The Board Master raised his eyebrows and said nothing.

The secretary looked at his nails. "I take it you know the location of this robot world."

"Naturally. Theor Realo was there.

His information up to now has proven very accurate."

"That's right. The albino. Well, why not go there?"

"Go there! Impossible?"

"May I ask why?"

"Look," said the Board Master with restrained impatience, "you're not here by our invitation, and we're not asking you to dictate our course of actions, but just to show you that I'm not looking for a fight, I'll give you a little metaphorical treatment of our case. Suppose we were presented with a huge and complicated machine, composed of principles and materials of which we knew next to nothing. It is so vast we can't even make out the relationship of the parts, let alone the purpose of the whole. Now, would you advise me to begin attacking the delicate mysterious moving parts of the machine with a detonating ray before I know what it's all about?"

"I see your point, of course, but you're becoming a mystic. The metaphor is far-fetched."

"Not at all. These positronic robots were constructed along lines we know nothing of as yet and were intended to follow lines with which we are entirely unacquainted. About the only thing we know is that the robots were put aside in complete isolation, to work out their destiny by themselves. To ruin that isolation would be to ruin the experiment. If we go there in a body, introducing unintended reactions, everything is ruined. The littlest disturbance—"

"Poppycock! Theor Realo has already gone there."

The Board Master lost his temper suddenly. "Don't you suppose I know that? Do you suppose it would ever have happened if that cursed albino hadn't been an ignorant fanatic without any knowledge of psychology at all? Galaxy knows what the idiot has done in the way of damage."

There was a silence. The secretary clicked his teeth with a thoughtful fingernail. "I don't know . . . I don't know. But I've got to find out. And I can't wait years."

He left, and the Board Master turned seethingly to Brand, "And now what's he getting at? And how are we going to stop him from going to the robot world if he wants to?"

"I don't see how he can go if we don't let him. He doesn't head the expedition."

"Oh, doesn't he? *That's* what I was about to tell you just before he came in. Ten ships of the fleet have landed on Dorlis since we arrived."

"What!"

"Just that."

"But what for?"

"That, my boy, is what I don't understand, either."

"Mind if I drop in?" said Wynne Murry, pleasantly, and Theor Realo looked up in sudden anxiety from the papers that lay in hopeless disarray on the desk before him.

"Come in. I'll clear off a seat for you." The albino hustled the mess off one of the two chairs in a state of twittering nerves.

Murry sat down and swung one long leg over the other. "Are you assigned a job here, too?" He nodded at the desk.

Theor shook his head and smiled feebly. Almost automatically, he brushed the papers together in a heap and turned them face down.

In the months since he had returned to Dorlis with a hundred psychologists of various degrees of renown, he had felt himself pushed farther and farther from the center of things. There was room for him no longer. Except to answer questions on the actual state of things upon the robot world, which he alone had visited, he played no part. And even there, he detected, or seemed to detect, anger that *he* should have gone, and not a competent scientist.

It was a thing to be resented. Yet, somehow, it had always been like that.

"Pardon me." He had let Murry's next remark slip.

The secretary repeated, "I say it's surprising you're *not* put to work then. You made the original discovery, didn't you?"

"Yes," the albino brightened. "But it went out of my hands. It got beyond me."

"You were on the robot world, though."

"That was a mistake, they tell me. I might have ruined everything."

Murry grimaced. "What really gets them, I guess, is that you've got a lot of first-hand dope that they didn't. Don't let their fancy titles fool you into thinking you're a nobody. A layman with common sense is better than a blind specialist. You and I—I'm the layman, too, you know—have to stand up for our rights. Here, have a cigarette."

"I don't sm—I'll take one, thank you."

The albino felt himself warming to the long-bodied man opposite. He turned the papers face upward again, and lit up, bravely but uncertainly.

"And you *were* on this robot world, that is the main point."

"Five years." Theor spoke carefully, skirting around urgent coughs.

"Would you answer a few questions about the world?"

"I suppose so. That's all they ever ask me about. But hadn't you better ask *them*? They've probably got it all worked out now." He blew the smoke as far from himself as possible.

Murry said, "Frankly, they haven't even begun and I want the information without benefit of confusing psychological translation. First of all, what kind of people—or things—are these robots? You haven't a photocast of one of them, have you?"

"Well, no. I didn't like to take 'casts of them. But they're not things. They're *people*!"

"No? Do they look like—people?"

"Yes—mostly. Outside, anyway. I brought some microscopic studies of the cellular structure that I got hold of. The Board Master has them. They're different inside, you know, greatly simplified. But you'd never know that. They're interesting—and nice."

"Are they simpler than the other life of the planet?"

"Oh, no. It's a very primitive planet. And . . . and," he was interrupted by a spasm of coughing and crushed the cigarette to death as unobtrusively as possible. "They've got a protoplasmic base, you know. I don't think they have the slightest idea they're robots."

"No. I don't suppose they would have. What about their science?"

"I don't know. I never got a chance to see. And everything was so different. I guess it would take an expert to understand."

"Did they have machines?"

The albino looked surprised. "Well, of course. A good many, of all sorts."

"Large cities?"

"Yes!"

The secretary's eyes grew thoughtful. "And you like them. Why?"

Theor Realo was brought up sharply. "I don't know. They were just likable. We got along. They didn't bother me so. It's nothing I can put my finger on. Maybe it's because I have it so hard getting along back home, and they weren't as difficult as real people."

"They were more friendly?"

"N-no. Can't say so. They never quite accepted me. I was a stranger, didn't know their language at first—all that. But"—he looked up with sudden brightness—"I understood them better. I could tell what they

were thinking better. I— But I don't know why."

"Hm-m-m. Well—another cigarette? No? I've got to be walloping the pillow now. It's getting late. How about a twosome at golf tomorrow? I've worked up a little course. It'll do. Come on out. The exercise will put hair on your chest."

He grinned and left.

He mumbled one sentence to himself: "It looks like a death sentence"—and whistled thoughtfully as he passed along to his own quarters.

He repeated the phrase to himself when he faced the Board Master the next day, with the sash of office about his waist. He did not sit down.

"Again?" said the Board Master, wearily.

"Again!" assented the secretary. "But real business this time. I may have to take over direction of your expedition."

"What! Impossible, sir! I will listen to no such proposition."

"I have my authority." Wynne Murry presented the metalloid cylinder that snapped open at a flick of the thumb. "I have full powers and full discretion as to their use. It is signed, as you will observe, by the chairman of the Congress of the Federation."

"So— But why?" The Board Master, by an effort, breathed normally. "Short of arbitrary tyranny, is there a reason?"

"A very good one, sir. All along we have viewed this expedition from different angles. The Department of Science and Technology views the robot world not from the point of view of a scientific curiosity, but from the standpoint of its interference with the peace of the Federation. I don't think you've ever stopped to consider the danger inherent in this robot world."

"None that I can see. It is thoroughly isolated and thoroughly harmless."

"How can you know?"

"From the very nature of the experiment," shouted the Board Master angrily. "The original planners wanted as nearly a completely closed system as possible. Here they are, just as far off the trade routes as possible, in a thinly populated region of space. The whole idea was to have the robots develop free of interference."

Murry smiled. "I disagree with you there. Look, the whole trouble with you is that you're a theoretical man. You look at things the way they ought to be and I, a practical man, look at things as they are. No experi-

ment can be set up and allowed to run indefinitely under its own power. It is taken for granted that somewhere there is at least an observer who watches and *modifies* as circumstances warrant."

"Well?" said the Board Master stolidly.

"Well, the observers in this experiment, the original psychologists of Dorlis, passed away with the First Confederation, and for fifteen thousand years the experiment has proceeded by itself. Little errors have added up and become big ones and introduced alien factors which induced still other errors. It's a geometric progression. And there's been no one to halt it."

"Pure hypothesis."

"Maybe. But you're interested only in the robot world, and I've got to think of the entire Federation."

"And just what possible danger can the robot world be to the Federation? I don't know *what* in Arcturus you're driving at, man."

Murry sighed. "I'll be simple, but don't blame me if I sound melodramatic. The Federation hasn't had any internal warfare for centuries. What will happen if we come into contact with these robots?"

"Are you afraid of one world?"

"Could be. What about their science? Robots can do funny things sometimes."

"What science can they have? They're not metal-electricity supermen. They're weak protoplasmic creatures, a poor imitation of actual humanity, built around a positronic brain adjusted to a set of simplified human psychological laws. If the word 'robot' is scaring you—"

"No, it isn't, but I've talked to Theor Realo. He's the only one who's seen them, you know."

The Board Master cursed silently and fluently. It came of letting a weak-minded freak of a layman get underfoot where he could babble and do harm.

He said, "We've got Realo's full story, and we've evaluated it fully and capably. I assure you no harm exists in them. The experiment is so thoroughly academic, I wouldn't spend two days on it, if it weren't for the broad scope of the thing. From what we see, the whole idea was to build up a positronic brain containing modifications of one or two of the fundamental axioms. We haven't worked out the details, but they must be minor, as it was the first experiment of this nature ever tried, and even the great mythical psychologists of that day had to progress stepwise. Those

robots, I tell you, are neither supermen nor beasts. I assure you—as a psychologist.”

“Sorry! I’m a psychologist, too. A little more rule-of-thumb, I’m afraid. That’s all. But even little modifications! Take the general spirit of combativeness. That isn’t the scientific term, but I’ve no patience for that. You know what I mean. We humans used to be combative. But it’s being bred out of us. A stable political and economic system doesn’t encourage the waste energy of combat. It’s not a survival factor. But suppose the robots are combative. Suppose as the result of a wrong turn during the millennia they’ve been unwatched, they’ve become far more combative than ever their first makers intended. They’d be uncomfortable things to be with.”

“And suppose all the stars in the Galaxy became novae at the same time. Let’s *really* start worrying.”

“And there’s another point.” Murry ignored the other’s heavy sarcasm. “Theor Realo liked those robots. He liked robots better than he likes real people. He felt that he fitted there, and we all know he’s been a bad misfit in his own world.”

“And what,” asked the Board Master, “is the significance of that?”

“You don’t see it?” Wynne Murry lifted his eyebrows. Theor Realo likes those robots because he is *like* them, obviously. I’ll guarantee right now that a complete psychic analysis of Theor Realo will show a modification of several fundamental axioms, and the same ones as in the robots.

“And,” the secretary drove on without a pause. “Theor Realo worked for a quarter of a century to prove a point, when all science would have laughed him to death if they had known about it. There’s fanaticism there; good, honest, *inhuman* perseverance. *Those robots are probably like that!*”

“You’re advancing no logic. You’re arguing like a maniac, like a moon-struck idiot.”

“I don’t need strict mathematical proof. Reasonable doubt is sufficient. I’ve got to protect the Federation. Look, it is reasonable, you know. The psychologists of Dorlis weren’t as super as all that. They have to advance stepwise, as you yourself pointed out. Their humanoids—let’s not call them robots—were only imitations of human beings and they couldn’t be good ones. Humans possess certain very, very complicated reaction systems—things like social

consciousness, and a tendency toward the establishment of ethical systems; and more ordinary things like chivalry, generosity, fair play and so on, that simply can’t possibly be duplicated. I don’t think those humanoids can have them. But they *must* have perseverance, which practically implies stubbornness and combativeness, if my notion on Theor Realo holds good. Well, if their science is anywhere at all, then I don’t want to have them running loose in the Galaxy, if our numbers are a thousand or millennia they’ve been unwatched, they’ve permit them to do so!”

The Board Master’s face was rigid. “What are your immediate intentions?”

“As yet undecided. But I think I am going to organize a small-scale landing on the planet.”

“Now wait.” The old psychologist was up and around the desk. He seized the secretary’s elbow. “Are you quite certain you know what you’re doing? The potentialities in this massive experiment are beyond any possible precalculation by you or me. You can’t know what you’re destroying.”

“I know. Do you think I enjoy what I’m doing? This isn’t a hero’s job. I’m enough of a psychologist to want to know what’s going on, but I’ve been sent here to protect the Federation and to the best of my ability I intend doing it—and a dirty job it is. But I can’t help it.”

“You can’t have thought it out. What can you know of the insight it will give us into the basic ideas of psychology? This will amount to a fusion of two Galactic systems, that will send us to heights that will make up in knowledge and power a million times the amount of harm the robots could ever do, if they *were* metal-electricity supermen.”

The secretary shrugged. “Now you’re the one that is playing with faint possibilities.”

“Listen, I’ll make a deal. Blockade them. Isolate them with your ships. Mount guards. But don’t touch them. Give us more time. Give us a chance. You must!”

“I’ve thought of that. But I would have to get Congress to agree to that. It would be expensive, you know.”

The Board Master flung himself into his chair in wild impatience. “What kind of expense are you talking about? Do you realize the nature of the repayment if we succeed?”

Murry considered; then, with a half smile, “What if they develop interstellar travel?”

The Board Master said quickly, "Then I'll withdraw my objections."

The secretary rose, "I'll have it out with Congress."

Brand Gorla's face was carefully emotionless, as he watched the Board Master's stooped back. The cheerful pet talks to the available members of the expedition lacked meat, and he listened to them impatiently.

He said, "What are we going to do now?"

The Board Master's shoulders twitched and he didn't turn. "I've sent for Theor Realo. That little fool left for the Eastern Continent last week—"

"Why?"

The older man blazed at the interruption. "How can I understand anything that freak does. Don't you see that Murry's right? He's a psychic abnormality. We had no business leaving him unwatched. If I had ever thought of looking at him twice, I wouldn't have. He's coming back now, though, and he's going to stay back." His voice fell to a mumble. "Should have been back two hours ago."

"It's an impossible position, sir," said Brand, flatly.

"Think so?"

"Well— Do you think Congress will stand for an indefinite patrol off the robot world? It runs into money and average Galactic citizens aren't going to see it as worth the taxes. The psychological equations degenerate into the axioms of common sense. In fact, I don't see why Murry agreed to consult Congress."

"Don't you?" The Board Master finally faced his junior. "Well, the fool considers himself a psychologist, Galaxy help us, and that's his weak point. He flatters himself that he doesn't want to destroy the robot world in his heart, but that it's the good of the Federation that requires it. And he'll jump at any reasonable compromise. Congress won't agree to it indefinitely, you don't have to point that out to me." He was talking quietly, patiently. "But I will ask for ten years, two years, six months—as much as I can get. I'll get something. In that time, we'll learn new facts about the world. Somehow we'll strengthen our case and renew the agreement when it expires. We'll save the project yet."

There was a short silence and the Board Master added slowly and bitterly, "And that's where Theor Realo plays a vital part."

Brand Gorla watched silently, and waited.

The Board Master said, "On that one point Murry saw what we didn't. Realo is a psychological cripple, and is our real clue to the whole affair. If we study him, we'll have a rough picture of what the robot is like, distorted of course, since his environment has been a hostile, unfriendly one. But we can make allowance for that, estimate his nature in a— Ahh, I'm tired of the whole subject."

The signal box flashed, and the Board Master sighed. "Well, he's here. All right, Gorla, sit down, you make me nervous. Let's take a look at him."

Theor Realo came through the door like a comet and brought himself to a panting halt in the middle of the floor. He looked from one to the other with weak, peering eyes.

"How did all this happen?"

"All what?" said the Board Master coldly. "Sit down. I want to ask you some questions."

"No. You first answer *me*."

"Sit down!"

Realo sat. His eyes were brimming. "They're going to destroy the robot world."

"Don't worry about that."

"But you said they could if the robots discovered interstellar travel. You said so. You fool. Don't you see—" He was choking.

The Board Master frowned uneasily. "Will you calm down and talk sense?"

The albino gritted his teeth and forced the words out. "But they'll *have* interstellar travel before long."

And the two psychologists shot toward the little man.

"What!"

"Well . . . well, what do you think?" Realo sprang upward with all the fury of desperation. "Did you think I landed in a desert or in the middle of an ocean and explored a world all by myself? Do you think life is a storybook. I was captured as soon as I landed and taken to a big city. At least, I think it was a big city. It was different from our kind. It had— But I won't tell you."

"Never mind the city," shrieked the Board Master. "You were captured. Go ahead."

"They studied *me*. They studied my machine. And then, one night, I left, to tell the Federation. They didn't know I left. They didn't want me to leave." His voice

broke. "And I would have stayed as soon as not, but the Federation had to know."

"Did you tell them anything about your ship?"

"How could I? I'm no mechanic. I don't know the theory or construction. But I showed them how to work the controls and let them look at the motors. That's all."

Brand Gorla said, to himself mostly. "Then they'll never get it. That isn't enough."

The albino's voice raised itself in sudden shrieking triumph. "Oh, yes, they will. I know them. They're machines, you know. They'll work on that problem. And they'll work. And they'll work. And they'll never quit. And they'll get it. They got enough out of me. I'll bet they got enough."

The Board Master looked long, and turned away—wearily. "Why didn't you tell us?"

"Because you took my world away from me. I discovered it—by myself—all by myself. And after I had done all the real work, and invited you in, you threw me out. All you had for me was complaints that I had landed on the world and might have ruined everything by interference. Why should I tell you? Find out for yourselves if you're so wise, that you could afford to kick me around."

The Board Master thought bitterly, "Misfit! Inferiority complex! Persecution mania! Nice! It all fits in now that we've bothered to take our eyes off the horizon and see what was under our nose. And now it's all ruined."

He said, "All right, Realo, we all lose. Go away."

Brand Gorla said tightly, "All over? Really all over?"

The Board Master answered, "Really all over. The original experiment as such is over. The distortions created by Realo's visit will easily be large enough to make the plans we are studying here a dead language. And besides—Murry is right. If they have interstellar travel, they're dangerous."

Realo was shouting, "But you're not going to destroy them. You can't destroy them. They haven't hurt anyone."

There was no answer, and he raved on, "I'm going back. I'll warn them. They'll be prepared. I'll warn them."

He was backing toward the door, his thin white hair bristling, his red-rimmed eyes bulging.

The Board Master did not move to stop him when he dashed out.

"Let him go. It was *his* lifetime. I don't care any more."

Theor Realo smashed toward the robot world at an acceleration that was half choking him.

Somewhere ahead was the dustspeck of an isolated world with artificial imitations of humanity, struggling along in an experiment that had died. Struggling blindly toward a new goal of interstellar travel that was to be their death sentence.

He was heading toward that world, toward the same city in which he had been "studied" the first time. He remembered it well. It's name was the first words of their language he had learned.

New York!



PRACTICALLY NOTHING

"PRACTICALLY nothing is as expensive as practically nothing" is a nice, cockeyed-sounding way of stating that a near vacuum is an expensive industrial raw material. And, of course, like any other commodity, the nearer it approaches 100 per cent. purity, the nearer the cost approaches infinity, particularly when you want to work in that medium.

Consider the process of developing a new electronic tube. In this issue we carry an article on the design of electron multipliers, and of many electronic devices other than multipliers too, for that matter—the principle involved is fairly general. The theory is nice, and works well where secondary electrons are wanted—are the prime consideration. But in most vacuum tube amplifiers secondary electrons are simply static in the works—everything possible is done to suppress them. But they still show up, and they make for troubles not easily predictable on the basis of rubber sheets and shaped supports. The number of secondary electrons, and the consequent behavior of the tube, can be determined only by trying out actual tube elements in a properly evacuated tube.

But this properly evacuated tube consists of a glass or metal envelope, with the proposed electrodes mounted in place, and then subjected to a highly complex technique of evacuation. First, the loose gases must be pumped out to a hard vacuum. Then the envelope and inclosed electrodes must be degassed; all metals, all solids, soak up gas as a brick soaks up water, and to get that trapped gas out the material must be heated while the high-vacuum system pumps steadily. Proper, complete degassing takes time—a goodly number of hours. Usually a good bit of this can be skipped in test equipment, and the use of a chemical "getter"—a bit of metallic magnesium that will combine avidly with any of the ordinary gases to form solid compounds, perhaps—saves

time and does a final clean-up job. Then the new tube is ready for testing.

And perhaps half an hour of testing reveals that the electrode structure is wrong—this one should be shifted *here*. That, of course, is impossible; a new tube is made, degassed, and tested. Hm-m-m—now the interaction is such that this other one should be over this way—

In a laboratory established on the Moon, perhaps well up near the top of the crater walls of Tycho, to get above the lingering traces of lunar atmosphere, the laboratory worker, clad in an airsuit, could simply push the electrodes around in their completely degassed, but completely accessible environment of hard vacuum. A smaller body than the Moon would perhaps give a harder vacuum, but the presence of a gravitational field is helpful—men can work more efficiently.

There's a lot of chemical research, too, that needs a cheap, hard vacuum. Almost any organic substance is volatile in some degree before it breaks down—but usually the degree of volatility is so slight that only in a very hard vacuum can such sublimation be carried out.

Whether chemist, physicist, or atomic researcher, any researcher would be immeasurably aided by a "vacuum pump" that could sweep the pressure down to practically nothing through a 36" vacuum main! It would require him to redesign his whole technique of operation—and he'd love it. It would mean as much to organic chemistry, I suspect, as the development of micro-chemical analysis did.

Unlimited hard vacuum awaits, closer to New York than Melbourne is, but in the opposite direction. Melbourne's a lot nearer these days—airplanes changed things. And there are rocket-assisted airplanes now that may shorten the distance the other way—

THE EDITOR.

WHY WORRY?



How often have you heard it said, 'I am worried to death'?

What do you suppose would happen if a person who was putting himself into mental, moral and physical bankruptcy by worrying were to convert all this worry-energy into constructive action? In no time at all he would have accomplished so much that he would have nothing to worry about.

Nothing is more discouraging to a worrying person than to have someone say, 'Oh, don't worry, it will all come out right!'

That is not reassuring at all. The worrying one can't see how it is going to come out all right. But if the men and women who worry could be shown how to overcome the troubles and difficulties that cause worry, they soon would cease wasting their very life-blood in worrying. Instead they would begin devoting their energies to a constructive effort that would gain them freedom from worry for the rest of their lives.

You say that sounds plausible, but can it be done?

It can be done, and is being done, by Pelmanism, every day in the year. This is all the more remarkable because today the whole world is in an upset condition and people are worrying to an unusual extent. Yet, every mail brings letters to the Pelman Institute from grateful Pelmanists who have ceased to worry.

People today are all too prone to complain that they just have to worry. But once they become Pelmanists they cease this negative form of thought.

Personal and Individual

Pelmanists are not left to make the applications themselves. An experienced and sympathetic instructional staff shows them, in exact detail, how to apply the principles of Pelmanism to their own circumstances and aspirations. Thus every Pelman Course is an individual Course.

Over and over again our correspondents say, in effect: 'I feel that this Course was prepared for me, and me only'. Substantially this is so, for the instructional notes and letters of advice are entirely personal to the individual; they are for him or her only.

The Home Front

Time and energy to spend in service that will add to Britain's striking power! That is what we, men and women alike, are seeking now. At the same time our daily work must be done and done well. There is a proved way of organising time and conserving energy so that both daily work and public service will be well within the measure of our strength.

Every thought must be clear and definite, every word have its meaning, every act be stripped of any movement that wastes energy. All that is not essential to the proper carrying out of our daily work must be eliminated so that our strength will be greater for the intense effort that each one of us is anxious to make in that particular war work that lies near to our hands.

The demand from each of us is for quickened perceptive faculties, sounder judgment, greater decisiveness, prompter action, and all the courage and resolution we can muster in ourselves and inspire in others.

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